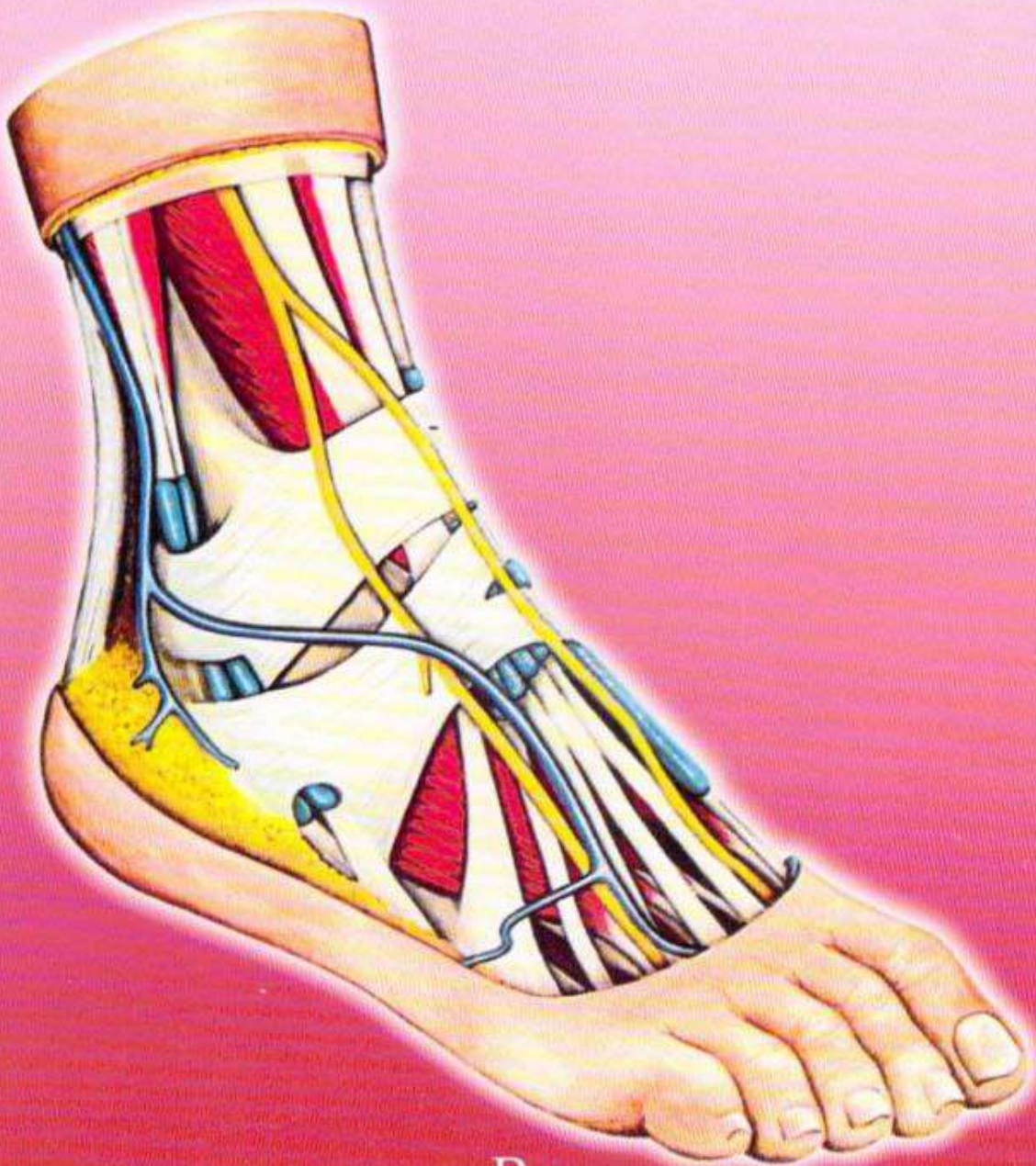


Anatomy
Computer Version

LOWER LIMB



By

DR. SAMEH DOSS (Ph.D)

PROFESSOR OF ANATOMY

FACULTY OF MEDICINE, CAIRO UNIVERSITY

VISIT...

LANZAROTE
Caliente.COM

Anatomy Computer
Version

LOWER LIMB

BY

DR. SAMEH DOSS (PH.D.)

PROFESSOR OF ANATOMY

FACULTY OF MEDICINE,, CAIRO UNIVERSITY

CONVERTED BY

THE SCIENTIFIC COMMITTEE OF THE FIFTH
BATCH-MEDICINE SCHOOL

AT

21ST SEPTEMBER UNIVERSITY FOR MEDICAL AND
APPLIED SCIENCE / FACULTY OF HUMAN
MEDICINE

CONTACT WITH THE COMMITTEE

t.me/samehdossbot

t.me/samehdoss

5thcommittee@gmail.com

BONES OF THE LOWER LIMB

1- THE HIP BONE

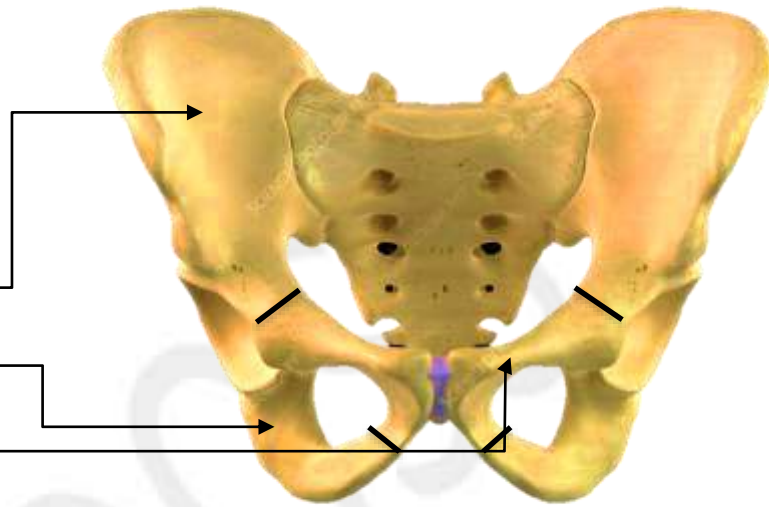
- * It is a large irregular bone forming the skeleton of the hip and the buttock.
- * The 2 hip bones constitute the pelvic girdle.

Structure:

(1) Ilium: the superior expanded part. _____

(2) Ischium : the postero-inferior part _____

(3) Pubis: the antero-inferior part. _____



N.B:

- 1- the 3 constituent bones of the hip unite together in the region of the acetabulum by Y-shaped cartilage which ossifies at the age of puberty.
- 2- the ilium corresponds to the scapula in the U.L.
- 3- the pubis corresponds to the clavicle the U.L.
- 4- the ischium corresponds to the coracoid process.

Side determination(Rt. Or Lt.):

- 1- the iliac crest lies above
- 2- the obturator foramen lies below.
- 3- the acetabulum is directed laterally.
- 4- the ischial tuberosity lies postero inferiorly.

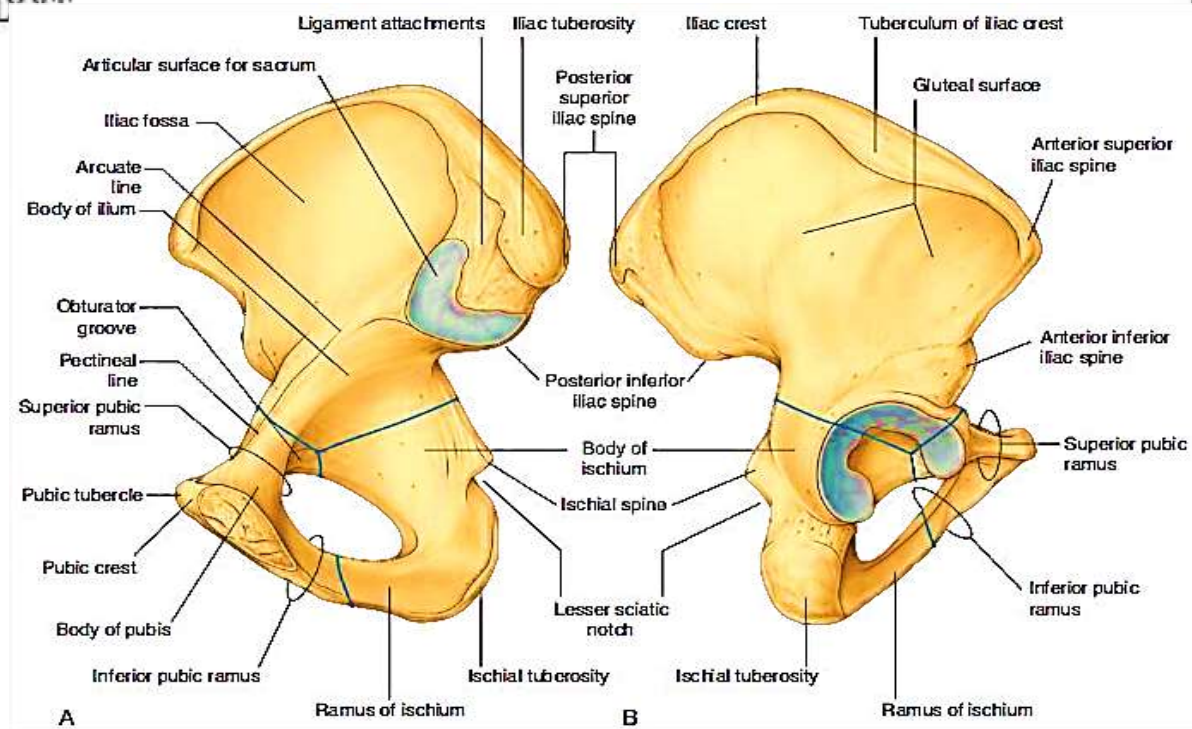
Anatomical position of the hip bone:

- 1- the ant-sup. iliac spine (A.S.I.S) and the pubic tubercle lie in the same vertical plane.
- 2- the ischial spine and the upper border of the symphysis pubis lie in the same horizontal plane.
- 3- the acetabular notch faces downwards.

N.B:

The description that follows applies to the hip bone in this anatomical position.





General features of the hip bone

I- THE ILIUM

* **Structure:** it is form of:

1- Ala of the ilium: the flat bony plate above the acetabulum.

2- Body of the ilium: the lower part forming the superior $\frac{2}{3}$ of the acetabulum.

* **Borders of ilium:** 4: anterior, Superior, medial, posterior:

(1)- the anterior border:

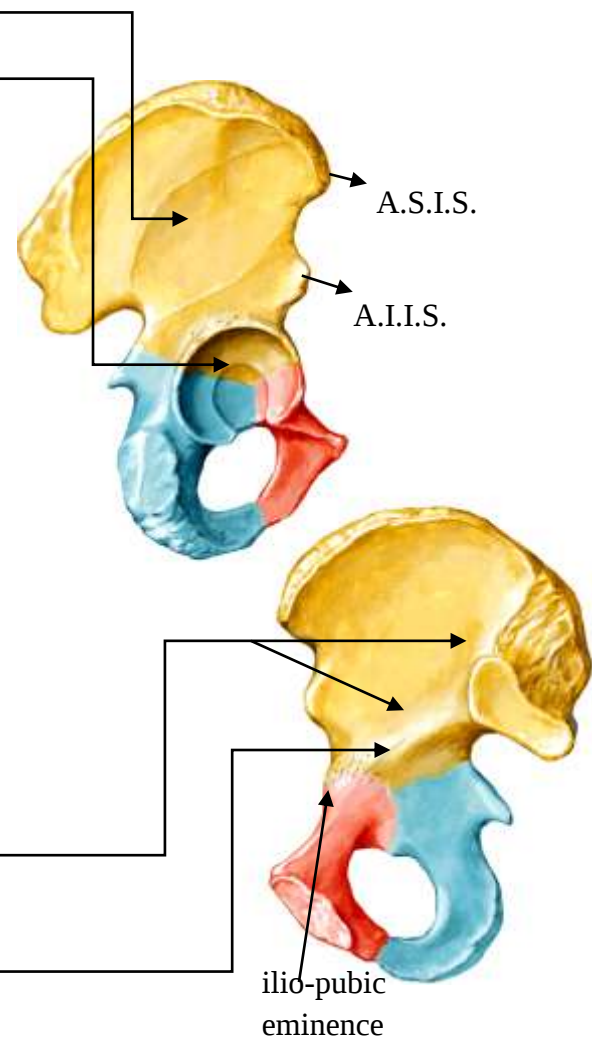
- begins at the anterior superior iliac spine (A.S.I.S).
- it descends downwards forming a notch then forms the anterior inferior iliac spine (A.I.I.S).
- it ends below at the acetabulum.

(2)- the posterior border :

- it begins at the posterior superior iliac spine (P.S.I.S).
- it forms the posterior inferior iliac spine (P.I.I.S) and ends by forming the upper part of the greater sciatic notch.

(3)- the medial border:

- it begins near the iliac crest forming the anterior border of the auricular surface then it forms the arcuate line which extends to the ilio-pubic eminence.



-this border separates the iliac fossa from the sacropelvic surface.

(4) The sup. border: iliac crest

* it begins at the A.S.I.S & ends at the P.S.I.S

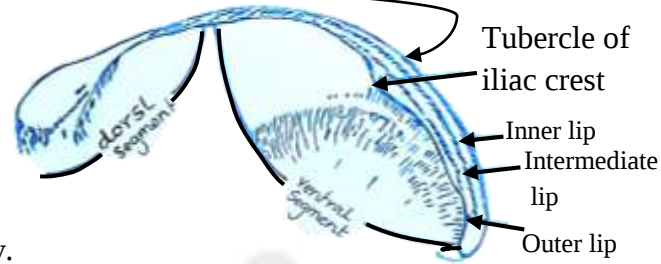
* it divided into ventral & dorsal segments:

(A) the ventral segment:

- it constitutes about $\frac{2}{3}$ of the crest & is concave medially.
- it is formed of outer & inner lips & intermediate rough area in between
- the outer lip carries a prominence called tubercle of iliac crest 2 " behind the A.S.A.S.

(B) the dorsal segment:

- constitutes the post $\frac{1}{3}$ of the crest & is concave laterally
- It is formed of outer & inner sloping areas separated by a ridge.



* **Surface of ilium** : 3 : gluteal surface, iliac fossa & sacropelvic surface :

(1) the gluteal surface:

- it is the outer rough surface of the ilium
- it is divided into 4 parts by 3 gluteal lines: post., middle, inferior converging towards the greater sciatic notch

(2) the iliac fossa:

It is the large concave area on the inner surface of ilium.

(3) the sacropelvic surface :

- it is the uneven area on the inner surface of ilium which lies below & behind the iliac fossa & separated from it by the med. border of ilium.

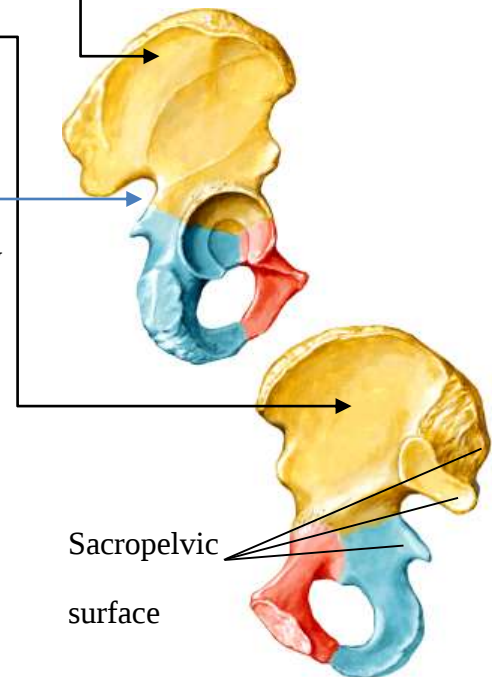
- it is subdivided into 3 parts :

(a) iliac tuberosity : it is the post-rough area found below the dorsal segment of the iliac crest. it gives attachment to the interosseous & dorsal sacroiliac ligament.

(b) auricular surface : lies in front of the iliac tuberosity.

-it articulates with the auricular surface of the sacro iliac joint

(c) pelvic surface : lies antero-inferior to the auricular surface. It shows a groove called the pre auricular sulcus along the upper border of the greater sciatic notch. The sulcus is deeper in the female than in the male

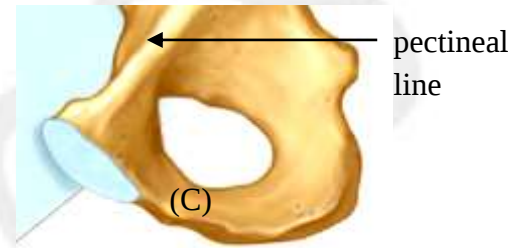
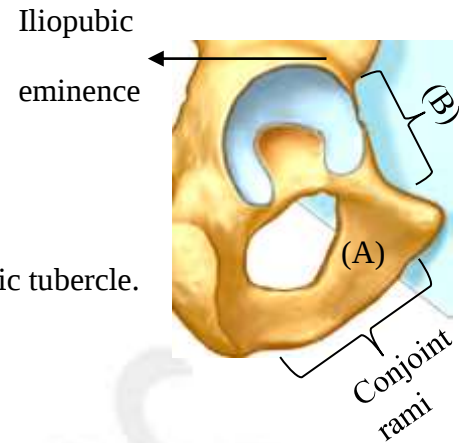


II- The pubis

- It constitutes the anteroinferior part of the hip bone.
- It is formed of a body and 2 rami: sup. and inferior.

(A) The body of pubis: it is flattened and has:

- 1- An upper border: called pubic crest which ends laterally by the pubic tubercle.
- 2- Anterior or femoral surface.
- 3- Posterior or pelvic surface.
- 4- Medial or symphyseal surface which articulates with
Opposite pubis to form the pubic symphysis.



(B) Superior pubic ramus:

- 1- It extends superolaterally to join the ilium at the iliopubic (ilio-pectineal) eminence.
- 2- Its lat.end forms $\frac{1}{5}$ of the acetabulum.
- 3- It has 3 borders and 3 surfaces:

* the borders are: 1- pectineal line. 2- obturator crest. 3- inf. border.

*The surface are: 1- pectineal surface. 2- pelvic surface. 3- obturator surface or groove.

(C) Inferior pubic ramus:

- 1- It extends posteroinferiorly from the body of pubis to join the ischial ramus forming the conjoined ischio pubic ramus (fusion occurs at the age of 7 years).
- 2- It has 2 border (med. and lat.) and 2 surfaces (outer and inner).

N.B : the inf. pubic ramus is everted in the male due to attachment of the crus of the penis.

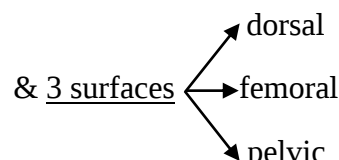
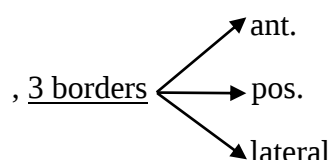
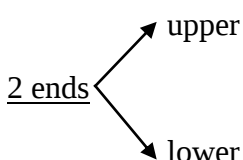
III- The Ischium

- It forms the posteroinferior part of the hip bone and the adjoining $\frac{2}{5}$ of the acetabulum.
- It consists of a body, a tuberosity and a ramus.

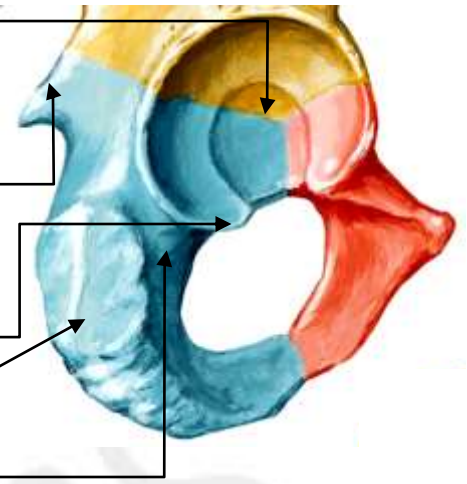
(A) Ischial body:

- 1- It is the thick part lying below and behind the acetabulum.

- It has:

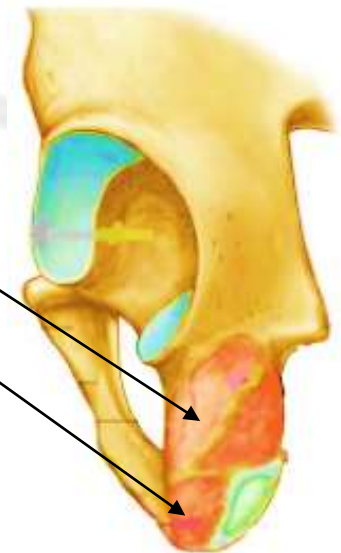


- the upper end : forms the posteroinf $\frac{2}{3}$ of the acetabulum
- the lower end : gives rise to ischial ramus at an acute angle
- the post. border: continuous with post border of ilium. It forms the lower part of the greater sciatic notch then projects to form the ischial spine, below which it presents the lesser sciatic notch.
- the ant. border: forms the post. part of the obturator margin
- the lateral border : forms the lateral margin of the ischial tuberosity.
- the femoral surface: lies between the ant & lateral border.
- the dorsal surface : continuous above with the gluteal surface of ilium. Below, it projects to form the ischial tuberosity.
- the pelvic surface : is smooth & forms part of the lat. wall of the true pelvis .



(B) Ischial tuberosity:

- it is a very strong piece of bone which projects from the lower end of the body of ischium.
- it divided by a transverse ridge into: upper quadrangular part
lower triangular part
- the upper quadrangular part: is subdivided by an oblique ridge into upper lat. area and lower med. area.
- the lower triangular part: is divided by a longitudinal ridge into lat. area and med. area.

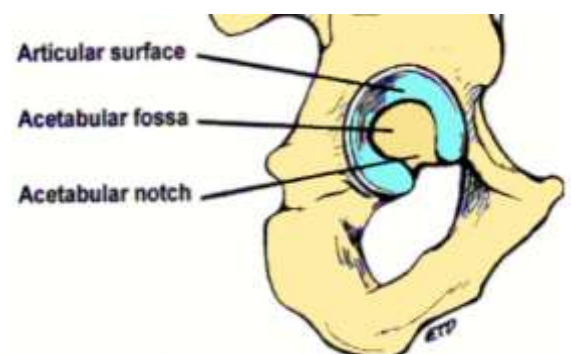


(C) ischial ramus:

- it projects from the lower end of the body of ischium.*
- it joins the inf. pubic ramus to form the conjoined ischiopubic ramus.
- it has 2 borders (upper & lower) and 2 surfaces : outer (femoral) & inner (pelvic)

IV- The Acetabulum

- * It is a cup- shaped cavity on the lateral aspect of the hip.
- * it is directed laterally, downwards & forwards.
- * it's margin is deficient inferiorly by the acetabular notch which is bridged by the transverse acetabular lig.
- * it's concavity presents a horse - shoe shaped articular surface occupying the ant , sup. parts & it called the lunate surface



- the lunate surface surrounds a non-articular articular depression called the acetabular fossa which is filled with fat (in the living).

N.B:

(1) the 3 parts of the hip bone meet together in the acetabulum:

- the pubis forms the ant $\frac{1}{5}$ of the lunate surface.
- the ilium forms the sup. $\frac{2}{5}$ of the lunate surface.
- the ischium forms the post. $\frac{2}{5}$ of lunate surface.

(2) the 3 bones remain separated by a Y-shaped cartilage till puberty.

V- The obturator foramen:

- it is a large gap in the hip bone lying anteroinferior to the acetabulum.
- it is bounded by the pubis & ischium only.
- in the living, it's incompletely closed by a membrane (obturator membrane) , leaving a narrow passage called obturator canal .

Muscles & ligaments attached to the hip bone.

I- the iliac crest

(A) Ventral segment: (has outer & inner lips & intermediate area)

1- the outer lip :

- (1) tensor fascia lata m : arise from its ant. part.
- (2) ilio-tibial tract: attached to the tubercle of iliac crest.
- (3) external abdominal oblique m: is inserted into its ant. $\frac{1}{2}$.
- (4) latissimus dorsi m: arises from its post. $\frac{1}{2}$.

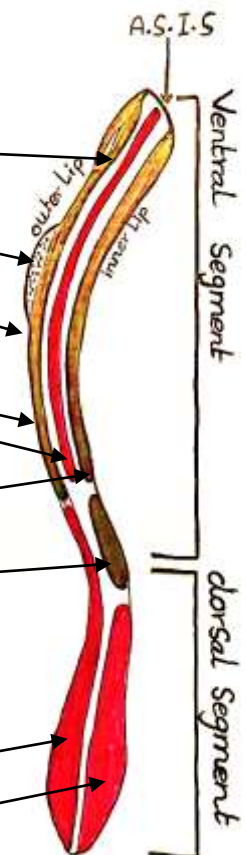
2- Intermediate area: gives origin to the internal abd. oblique m.

3- The inner lip:

- (1) transversus abdominis m.: arises from its ant. $\frac{2}{3}$ rd
- (2) quadratus lumborum m.: arises from its post. $\frac{1}{3}$ rd

(B) Dorsal segment: (has outer & inner sloping surfaces)

- (1) the outer sloping surface gives origin to gluteus Maximus m.
- (2) the inner sloping surface gives origin to sacrospinalis m.

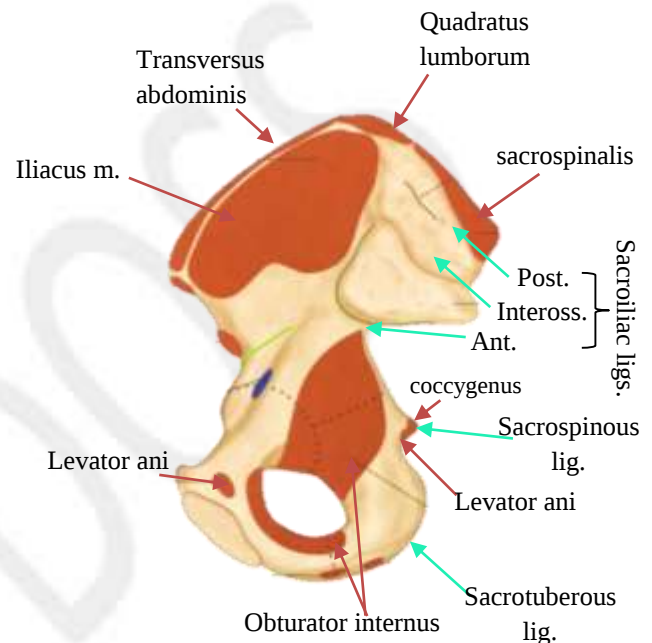


VI- Pubic bone :

- (1) pectineus m.: arises from pectineal surface & line of sup. pubic ramus.
- (2) adductor longus: arises from the front of body of pubis (just below pubic tubercle)
- (3) adductor berris: arises from front of body of pubis + inf. pubic ramus (below add. longus m.) .
- (4) adductor magnus (pubic part): arises from the conjoint ischiopubic ramus.
- (5) Gracilis m.: arises from lower part of the public body (close to symphysis public)
- (6) Obturator externus m.: arises from outer surfaces of obturator memb. + lower margin of obt. foramen.

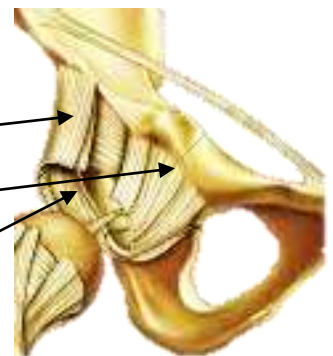
VII- Muscle of med. aspect of hip bone :

- 1) iliacus m.: arises from upper $\frac{2}{3}$ of iliac fossa .
- 2) obturator internus m.: arises from the margins of the obturator foramen & pelvis surface of ilium & ischium
- 3) lavator ani m.:
 - ant. fibers: arises from the back of the body of pubis.
 - post. fibers: arises from inner aspect of ischial spine .
- 4) Coccygeus m.: arises from inner aspect of ischial spine.



* Ligaments & membranes attached to the hip bone:

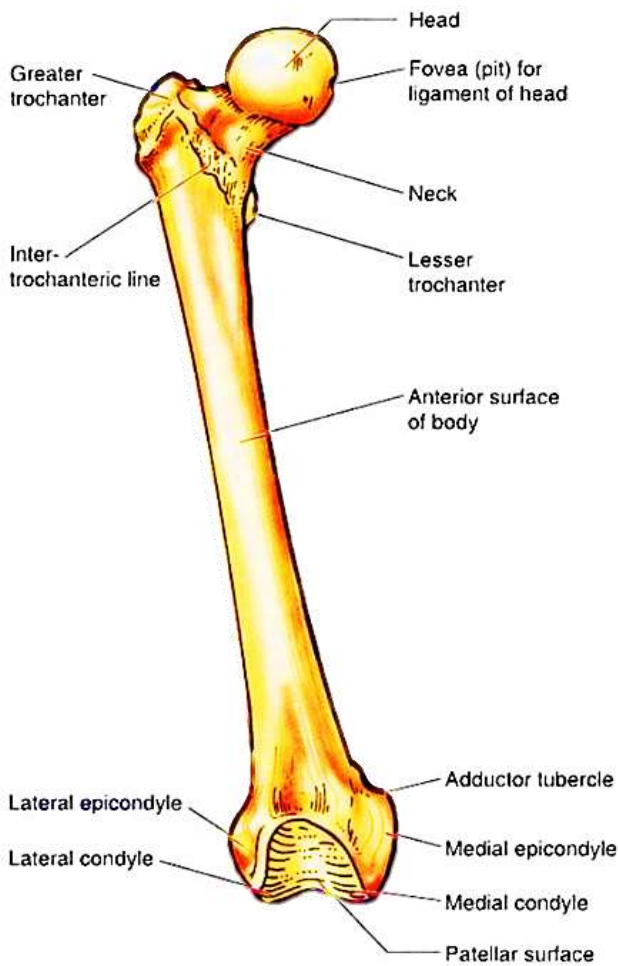
- 1) sacrospinous lig.: attached to med.border of ischial tuberosity
- 2) sacrospinous lig.: attached to the tip of ischial spine .
- 3) interosseous sacro-iliac lig.: attached to the iliac tuberosity (behind the auricular surface)
- 4) ant. Sacroiliac lig.: attached to the preauricular sulcus (in front of the auricular).
- 5) post.sacroiliac lig.: attached to the ilium behind the iliac tuberosity.
- 6) inguinal lig.: attached between the A.S.I.S (laterally) & public tubercle (medially) .
- 7) lacunar lig. & pectineal lig.: attached to pectineal line the sup. pubic ramus .
- 8) obturator membrane: attached to the margins of the obturator foramen (except its ant. part)
- 9) perineal membrane: attached to the 2 ischiopubic rami .
- 10) transverse acetobular lig.: attached to the margins of acetabular notch .
- 11) ilio femoral lig.: attached to the ant. inf. iliac spine
- 12) pubofemoral lig.: attached to the iliopubic eminence
- 13) ischiofemoral lig.: attached to a groove below the acetabulum



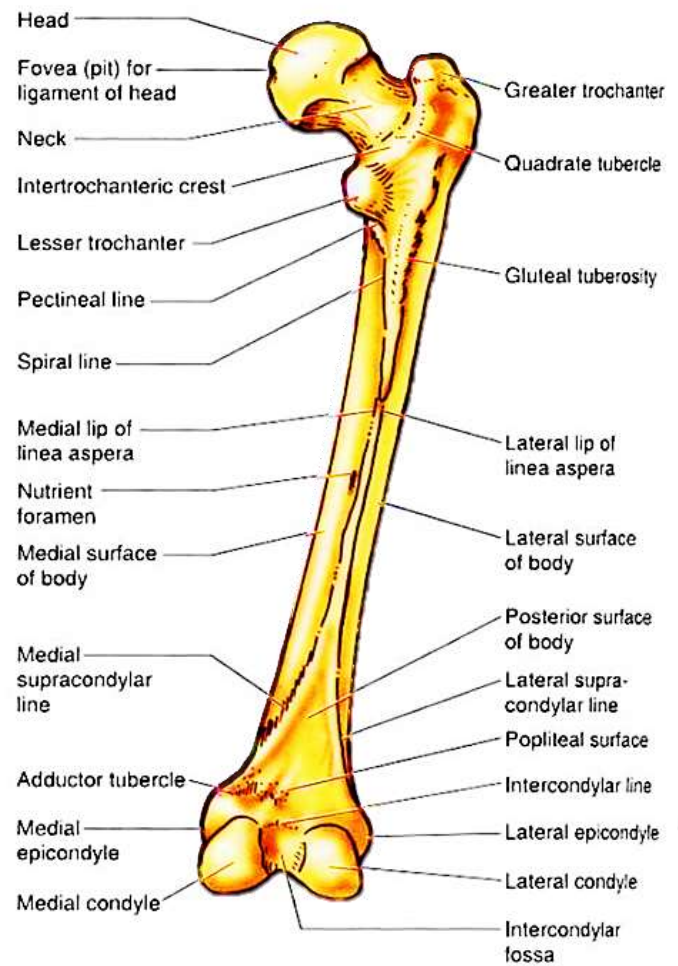
Articulation of the hip bone

- 1) The auricular surface of ilium articulates with the sacrum by synovial joint (sacroiliac joint)
- 2) The acetabulum articulates with the head of femur by ball & socket synovial joint (hip joint)
- 3) The symphysis surface of public articulates with its fellow of the opposite side by 2ry cartilaginous joint (symphysis pubis)

2- Femur



(A) Anterior view of right femur



(B) Posterior view of right femur

- Site: it is the bone of the thigh. It is about 45 cm (the longest bone in the body)

- General features: it is a typical long bone formed of

- 1- upper end
- 2- shaft
- 3- lower end

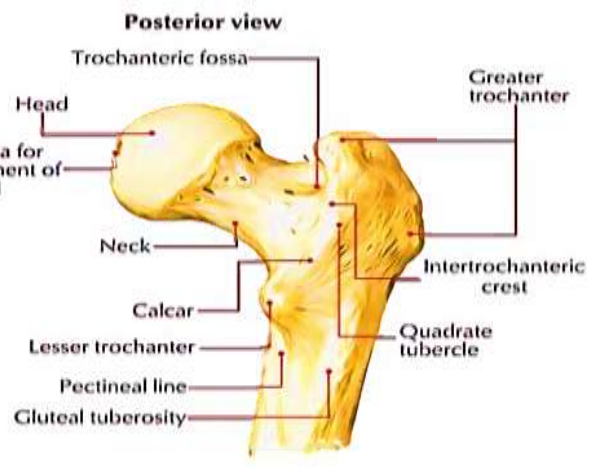
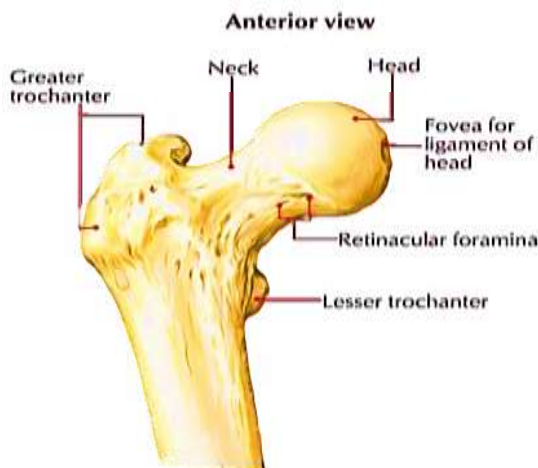
- Articulations:

- (1) the head : articulates with the acetabulum in the hip joint
 - (2) the 2 femoral condyles articulates with the 2 tibial condyles
 - (3) the patellar surface of the lower end articulates the post surface of patella
- } Knee joint

- Subcutaneous part :

- (1) the greater trochanter
- (2) the 2 condyles and epicondyles
- (3) the adductor tubercle

The upper end



(1) The Head:

- forms more than $\frac{1}{2}$ a sphere & is directed upward, forward & medially.
- near its centre, there is a depression called **pit or fovea** (gives attachment to round lig.).
- in the living, the head is covered by hyaline cartilage (except the fovea) & articulates with the acetabulum (hip joint).

(2) The neck:

- it is about 5 cm long & connects the head with the shaft.
- it forms an angle of $110-120^\circ$ with the axis of the shaft called the **Neck-Shaft angle**.
- the significance of this angle is to allow free movement of femur away from the pelvis. The angle is smaller in females due to the large size of the pelvis.

(3) Greater trochanter:

- a quadrangular eminence which projects laterally & upwards at the junction of the neck & shaft.
- its lat. surface carries an oblique ridge.
- its med. surface carries a depression called trochanteric fossa.

(4) Lesser trochanter:

- a small pyramidal projection which lies posteromedially at the junction of the neck with the shaft.

(5) Intertrochanteric line:

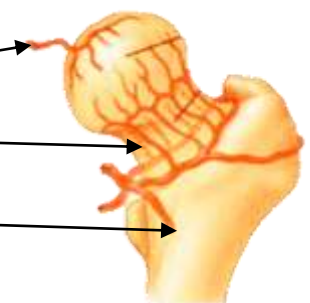
- a rough line joining the greater & lesser trochanters anteriorly.

(6) Intertrochanteric crest:

- a rounded ridge connecting the greater & lesser trochanters posteriorly.
- the intertrochanteric crest shows a prominence called **quadrate tubercle** above its m

Blood supply of the head of femur

- (1) from a small artery in the ligamentum teres (attached to the fovea)
- (2) from the blood vessels in the capsule of the hip joint (retinacular vessels) which reflect to the neck (main supply).
- (3) from the **ascending branch of the nutrient a.** in the shaft.



The shaft of femur

* It is convex forwards (to throw the line of the body weight in front of the knee joint thus keeping it passively extended).

* Its middle $\frac{1}{3}$ has 3 surfaces while its upper & lower thirds have 4 surfaces.

A- Middle $\frac{1}{3}$ of the shaft:

* It has 3 borders:

- 1- post. border (linea aspera)
- 2-med. border: rounded
- 3-lat. border: rounded

*It has 3 surfaces:

- 1-ant. surface
- 2-med. surface
- 3-lat. surface



- Linea aspera(post. border):

- it is a broad thick ridge forming the post. border of the middle $\frac{1}{3}$ of the shaft.
- it has 2 lips (lateral & medial) which lie close in the middle $\frac{1}{3}$ but diverge from each other in the upper $\frac{1}{3}$ & the lower $\frac{1}{3}$ of the shaft.

(a) in the upper $\frac{1}{3}$:

- the med. lip of linea aspera extends up forming the **spiral line** which winds around the med. aspect of the shaft below the lesser trochanter to reach the lower end of the intertrochanteric line.
- the lat. lip of linea aspera is continuous above with the gluteal tuberosity.

(b) in the lower $\frac{1}{3}$:

- the med. & lat. lips of the linea aspera diverge from each other forming the med. & lat. supracondylar lines.
- the med. supracondylar line ends below in a tubercle called the **adductor tubercle**.



B- the upper $\frac{1}{3}$ of the shaft:

* It is flattened posteriorly, having a post. surface in addition to the ant., lat. & med. surfaces.

* the post. surface is bounded

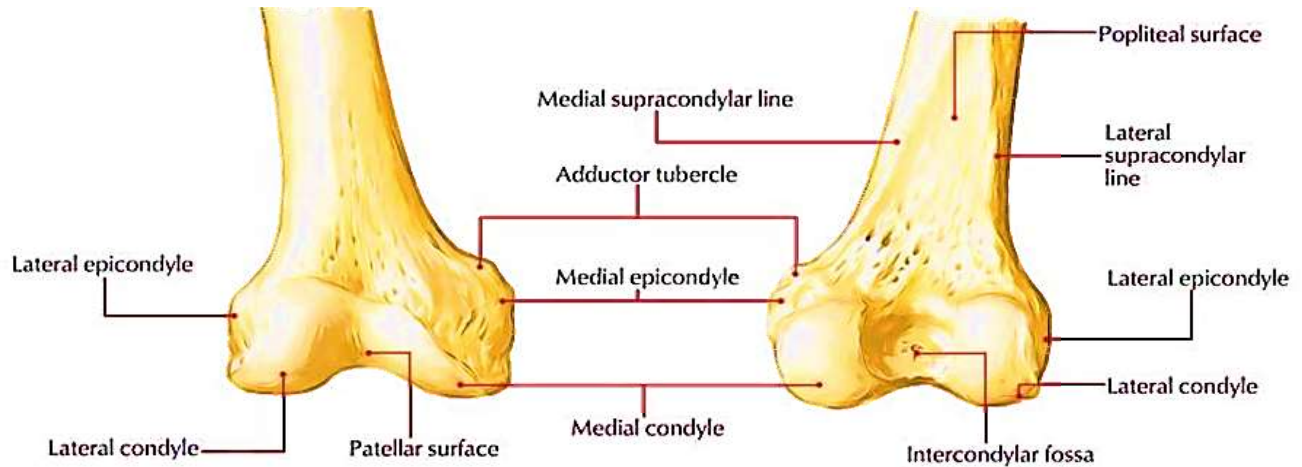
- laterally by gluteal tuberosity
- medially by the spiral line

* The pectineal line of femur: is a rough line on the post. surface of the upper $\frac{1}{3}$ of the shaft, extending from the lesser trochanter to the upper end of linea aspera.

C- the lower $\frac{1}{3}$ of the shaft:

* has also a post. surface called the popliteal surface which is bounded by the medial & lateral supracondylar lines.

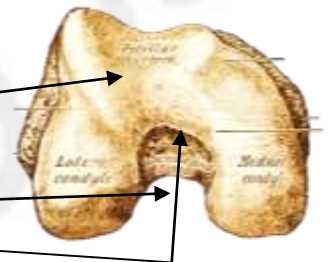
Lower end of femur:



* It is composed of 2 large condyles: medial and lateral

* Anteriorly, the 2 condyles fuse together forming an articular surface for the patella called the **patellar surface**.

* Posteriorly, the 2 condyles are separated by **intercondylar notch**. the notch is separated from the popliteal surface by **intercondylar line**.



(A) The medial condyle:

(1) It is larger and more curved than the lateral condyle as it is concerned mainly with the rotatory movements of the knee joint.

(2) It projects more downwards (to compensate for the obliquity of the shaft).

(3) The most prominent part of its med. surface is called **med. Epicondyle**, the upper part of the med. condyle (at the lower end of the med.).

(4) (Supracondylar line) carries a projection called the **adductor tubercle**



(B) The lateral condyle:

(1) Is smaller, thicker, stronger and less curved than the med. condyle as it is concerned mainly with body weight transmission.

(2) It projects more forwards (to prevent lat. dislocation of the patella).

(3) The most prominent part of its lat. surface is called **lat. epicondyle**.

(4) Below the lat. epicondyle, there is a groove called **popliteal sulcus**.



Identification of the side of femur (Rt. or Lt.)

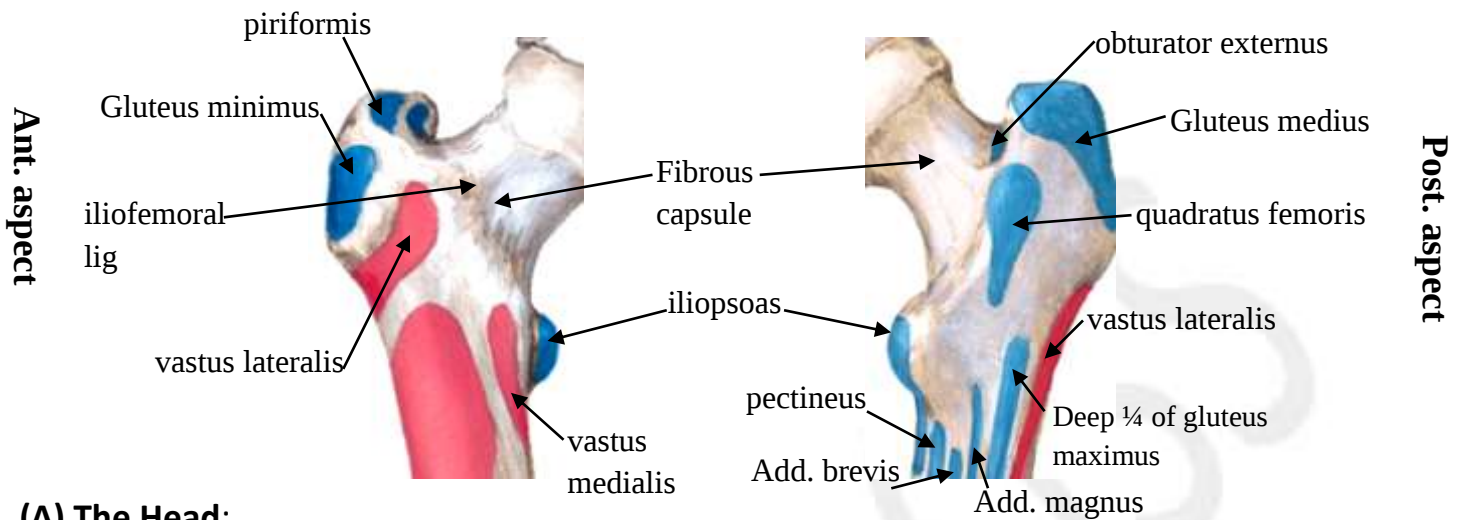
(1) The upper end is identified by the head.

(2) The head is directed medially.

(3) The shaft is convex forwards.

Muscles & ligaments attached to the femur

I- The upper end



(A) The Head:

the round ligament. (ligamentum teres) of the head is attached to the fovea.

N.B: it has no mechanical importance, its main function is to carry blood supply to the head of femur.

(B) The greater trochanter: gives insertion to 5 muscles:

- (1) piriformis: inserted into its upper border (top).
- (2) Gluteus minimus: inserted into anterior surface.
- (3) Gluteus medius: inserted into the oblique ridge on its lateral surface.
- (4) obturator internus (& the 2 gemilli):inserted in its medial surface.
- (5) obturator externus: inserted into the trochanteric fossa on the medial surface .

(C) The lesser trochanter: gives insertion to the **iliopsoas tendon**.

(D) Intertrochanteric line: gives attachment to:

- (1) fibrous capsule of the hip joint.
- (2) iliofemoral ligament.
- (3) origin of superior part of vastus medialis (from its lower end).
- (4) origin of superior part of vastus lateralis (from its upper end) .

(E) Quadrate tubercle & the bone below it: gives insertion to **quadratus femoris** muscle.

- (F) Gluteal tuberosity:**
- gives insertion to the deep ¼ of **Gluteus Maximus**.
 - its medial border: insertion of pubic part of **adductor magnus** muscle.
 - its lateral border: origin for vastus lateralis.

(G) back of neck of femur: gives attachment to the capsule of the hip joint 1cm. Proximal to the intertrochanteric Crest.

Muscles attached to the shaft of femur

1- Vastus intermedius: arises from the upper $\frac{3}{4}$ on the anterior & lateral surfaces

2- Vastus medialis: arises from the medial lip of linea aspera & its extensions:

- a- upwards along the spiral line to the lower part of intertrochanteric line.
- b- downwards along the upper part of medial supracondylar line.

3- Vastus lateralis: arises from the lateral lip of linea aspera & its extensions upwards along the lateral lip of the gluteal tuberosity to the upper part of the intertrochanteric line.

4- Short head of biceps: arises from linea aspera & the upper $\frac{1}{2}$ of lateral supracondylar ridge.

5- Articularis genu muscle: arises from a small area in the lower part of the anterior surface.

6- Pectineous muscle: inserted into the upper part of the pectineal line of femur.

7- Adductor brevis: inserted into the lower part of the pectineal line of femur + the upper part of the linea aspera.

8- Adductor Longus: inserted into the linea aspera

9- Adductor Magnus:

a- pubic part: inserted into the medial border of the gluteal tuberosity, medial lip of linea aspera & medial supracondylar ridge.

b- ischial part: inserted into the adductor tubercle.

N.B: the linea aspera gives attachment to 9 structures:

3 Insertions:

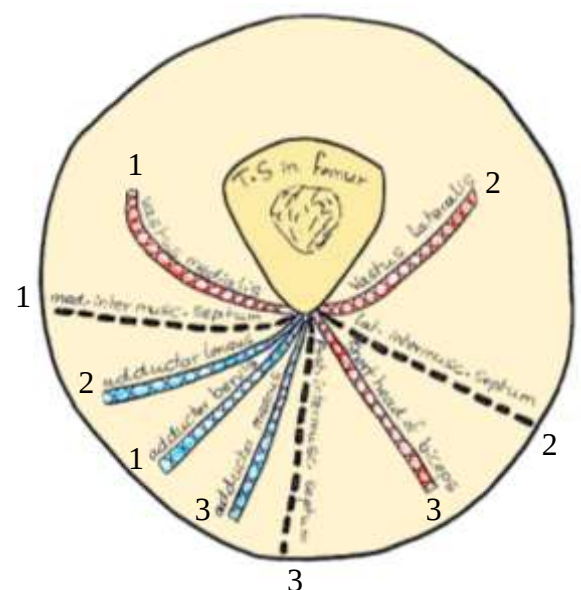
- 1- adductor brevis.
- 2- adductor longus.
- 3- adductor Magnus.

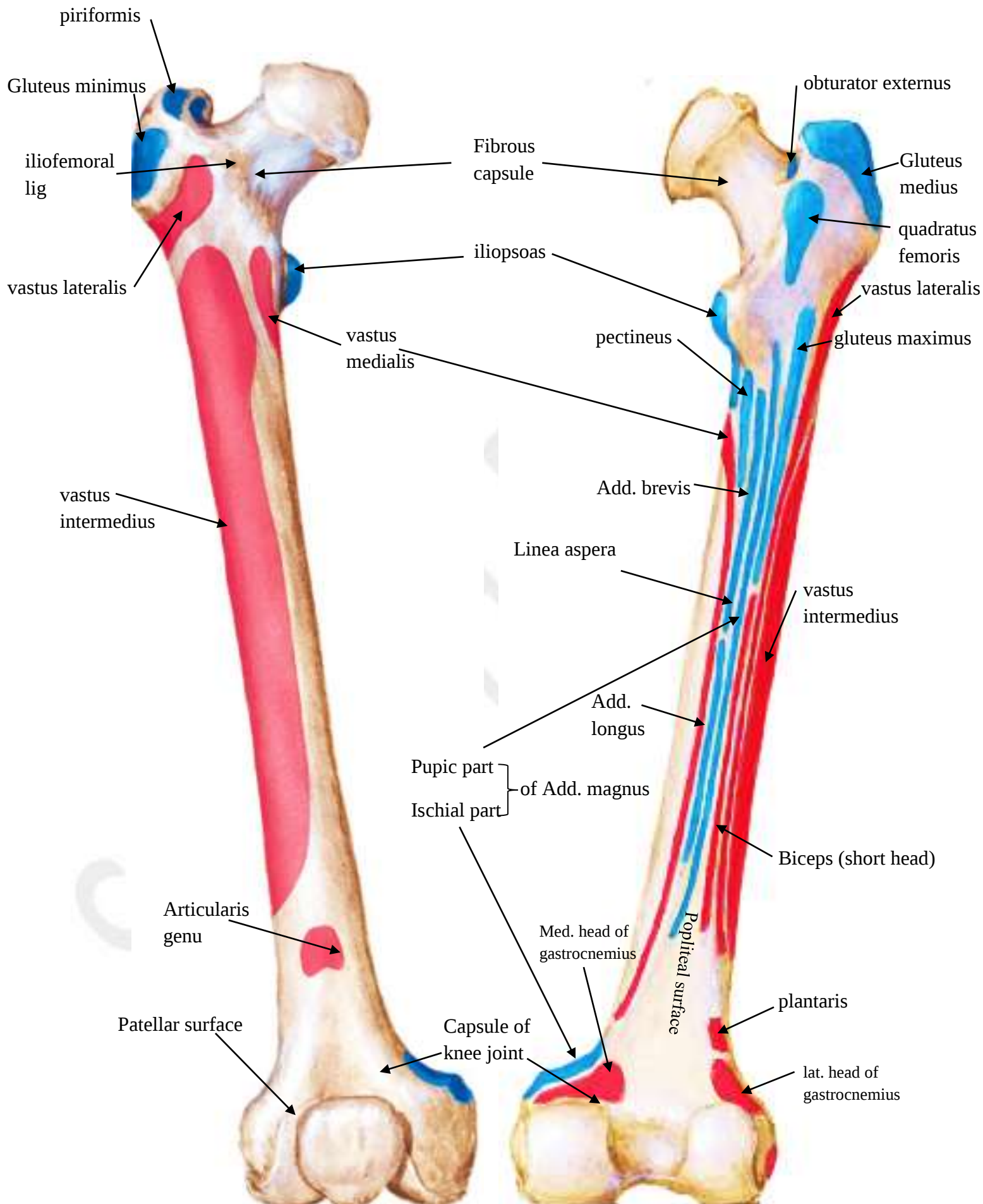
3 Origins:

- 1- vastus medialis.
- 2- vastus lateralis.
- 3- short head of biceps.

3 Intermuscular septa:

- 1- medial intermuscular septum.
- 2- lateral intermuscular septum.
- 3- posterior intermuscular septum.



Ant. Aspect of Rt. femur**Post. Aspect of Rt. femur**

Muscles & Ligaments attached to the lower end of femur:

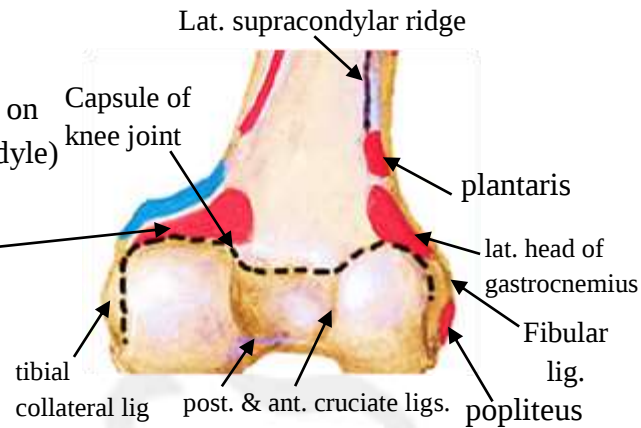
(I) Muscles:

1- **Lat. head of gastrocnemius**: arises from an impression on the surface of the lat. condyle (Just above & behind the lat. epicondyle)

2- **Med. head of gastrocnemius**: arise from the popliteal surface of femur above the med. condyle.

3- **plantaris (if present)**: arises from the popliteal surface above the lat. condyle.

4- **popliteus**: arises from the ant. part of the popliteal sulcus below the lat. epicondyle (intracapsular).



(II) Ligaments:

1- Capsule of knee joint: attached around the articular surface of lower end of femur.

2- tibial collateral lig. of knee joint: attached to the med. epicondyle.

3- fibular collateral lig. of knee joint: attached to the lat. epicondyle.

4- ant. cruciate lig.: attached to the post. part of the med. surface of the lat. condyle.

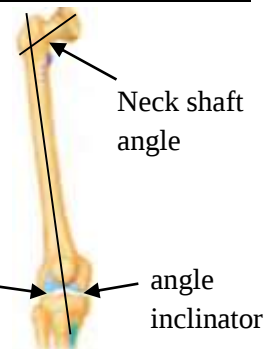
5- post. cruciate lig.: attached to the ant. part of the lat. surface of the med. condyle.

Angles of the femur

1- Neck shaft angle: 110° - 120° (see page 12).

2- Angle of inclination: it is the angle between the long axis of femur & the long axis of tibia. It is about 172° .

3- Angle of torsion: it is the angle between the long axis of the upper end & that of the lower end. It varies from 0° to 30° .



Ossification of the femur

The femur ossifies from 5 centers:

* one primary centre for shaft.

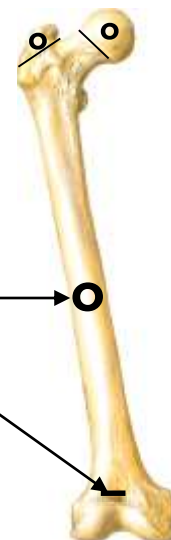
* 4 secondary centers in:

1-lower end (appears during the 9th month of intra uterine life).

2-greater trochanter (appears after birth).

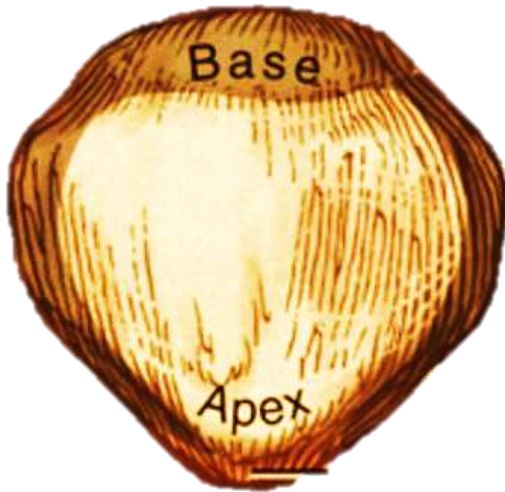
3-lesser trochanter (appears after birth).

4-the head (appears after birth).

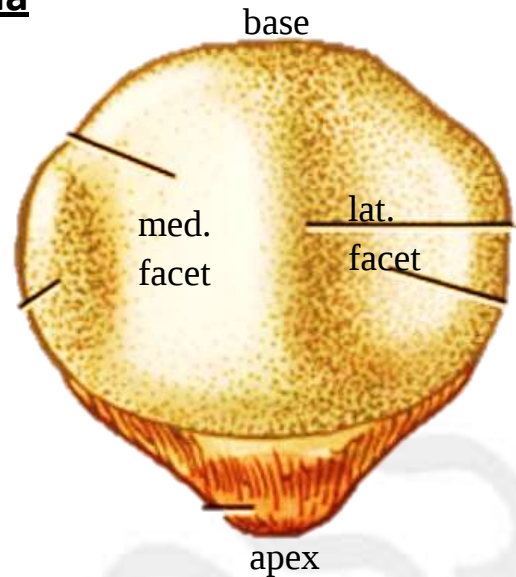


Patella

ant. surface of Rt. patella



Post. surface of Rt. patella



* The patella is the **largest sesamoid bone** in the body.

* **Position**: it lies in front of knee, inside the quadriceps tendon.

* **Shape**: triangular in shape having base above, apex below, ant. & post. surfaces, med. & lat. borders.

* **The Base** (upper border).

gives attachment to the tendon of insertion of quadriceps (mainly rectus femoris & vastus intermedius).

* **The Apex**: is directed downwards & give attachment to the patella ligament.

* **The Lateral border**: gives attachment to the lower fibres of vastus lateralis (lat. vastal retinaculum).

* **The Medial border**: gives attachment to the lower fibres of vastus medialis (med. vastal retinaculum).

* **The Anterior surface**: is rough & subcutaneous:

In the living, it is covered by an expansion from quadriceps tendon & separated from the skin by a bursa.

* **The Posterior surface**:

- its **lower** $\frac{1}{3}$ is rough & non articular.

- its **upper** $\frac{2}{3}$ is smooth & divided by a longitudinal ridge into 2 articular facets:

(1) a **large lat. facet** for articulation with the **lat. condyle of femur**.

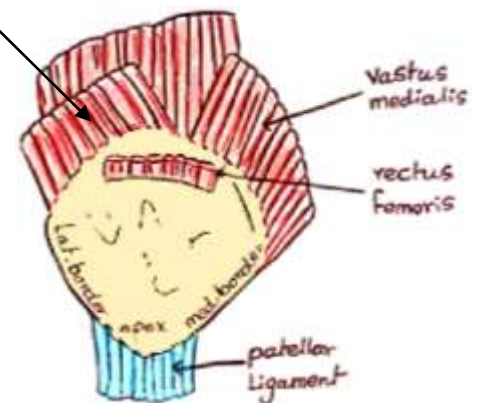
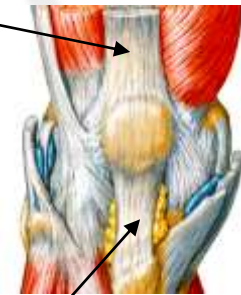
(2) a **small med. facet** for articulation with the **med. condyle of femur**.

* **Identification of the side of the patella (Rt or Lt):**

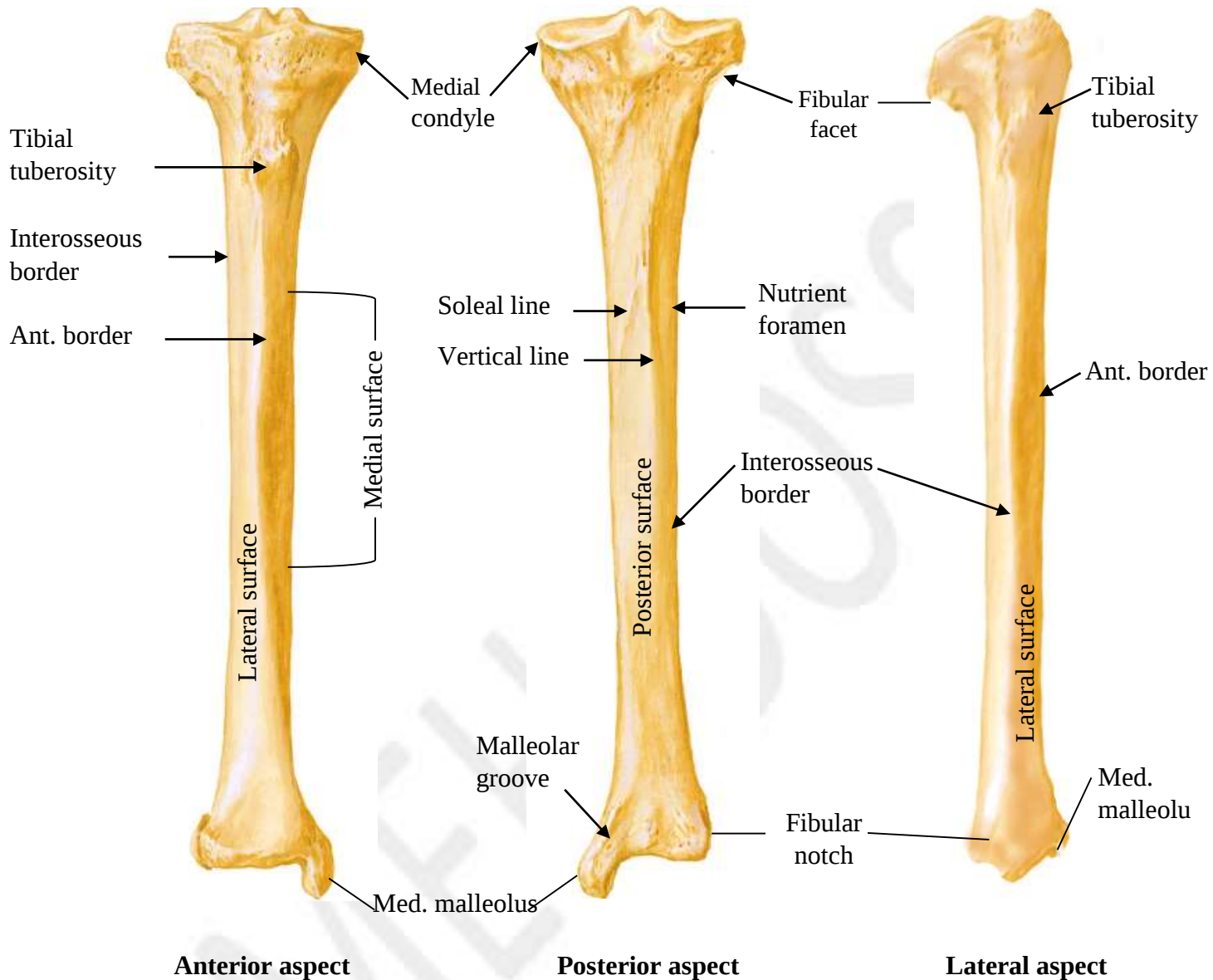
(1) the base is directed upwards & the apex downwards.

(2) the ant. surface is rough, the post. surface is smooth showing 2 articular facets.

(3) the lat. articular facet is larger than the med one



The Tibia



* **Type:** typical long bone.

* **Site:** it is the med. bone of the leg.

* **Function:**

1. Tibia alone receives the weight from femur & transmits it to the foot.
2. gives attachments to muscles.

* **Identification of the sides (Rt or Lt):**

1. the upper end is large & carries 2 condyles while the lower end is smaller & presents med. malleolus.
2. the tibial tuberosity is directed forwards.
3. the med. malleolus lies medially.

* **Structure:** it is composed of upper end, shaft & lower end.

I- Upper End of Tibia

(A) The medial condyle: (larger and more prominent posteriorly).

* **Its upper surface:**

- carries an oval facet for articulation with the med. condyle of femur.
- the periphery of the articular surface shows the print of the medial meniscus.

* **Its posterior aspect:**

presents a horizontal groove for the insertion of semimembranous m.

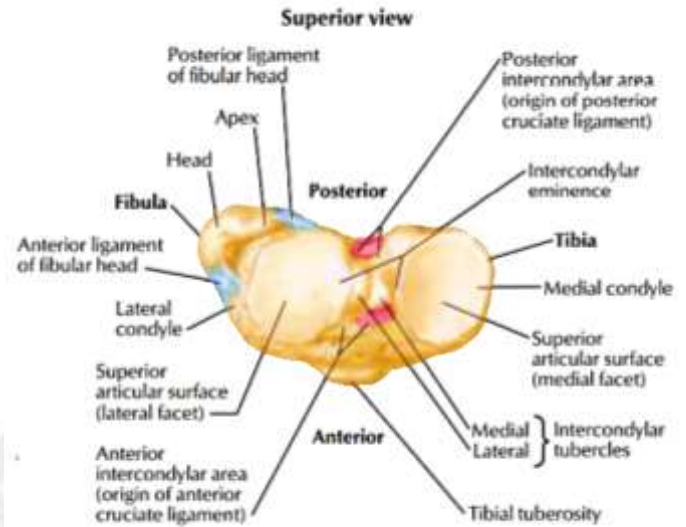
(B) The lateral condyle: (smaller)

* **Its upper surface:**

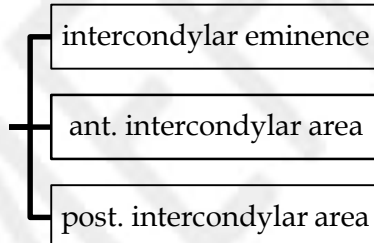
Carries a circular facet for articulation with the lat. condyle of femur.

* **Its posterior lateral surface:**

Presents a circular fibular facet for articulation with the head of fibula.



(C) Intercondylar area:



(between the upper surfaces of the 2 condyles)

- 1- in its middle part there is an elevation called intercondylar eminence

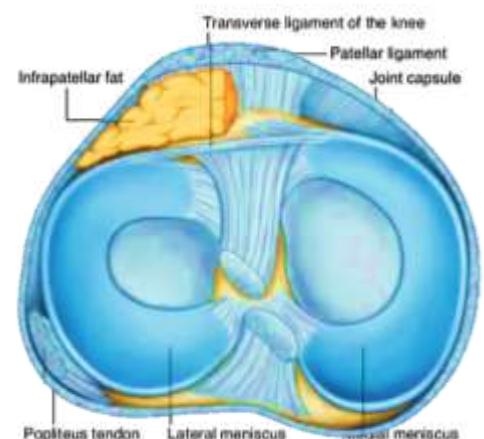
- * **Function:** the intercondylar eminence of tibia which has med. and lat. tubercles, project into the intercondylar notch of femur preventing side to side movements of femur on tibia.

- 2- **Anterior intercondylar area:** gives attachment to the following structures (arranged from before backwards):

- a) ant. horn of med. meniscus (M)
- b) ant. cruciate ligament (x)
- c) ant. horn of lat. meniscus (L)

- 3- **Post. intercondylar area:** gives attachment to:

- a) post. horn of lat. meniscus (L)
- b) post. horn of med. meniscus (M)
- c) post cruciate ligament (x)



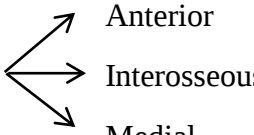
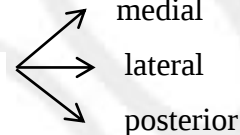
D) Tibial tuberosity: it is divided into:

- **upper smooth part:** gives attachment to the patellar ligament
- **lower rough part:** is related to bursa (infrapatellar bursa)

N.B: the line between the smooth & rough part indicates the position of epiphyseal cartilage i.e. the site of union between the epiphysis & the shaft

II- The Shaft of Tibia

*it is very thick above & becomes gradually thinner till the junction of the middle & lower thirds then becomes thick again at the lower end.

* It has 3 borders  & 3 Surfaces 

(1) The anterior border (shin of tibia)

Begin above at the tibial tuberosity

Its upper $\frac{3}{4}$ is sharp & felt subcutaneously

Its lower $\frac{1}{4}$ is rounded & ends below at the med. malleolus.

The anterior border gives attachment to the deep fascia of the leg.

(2) The interosseous border:

- begins above at the fibular facet

- ends below at the anterior border of the fibular notch.

- it gives attachment to the interosseous membrane except:

(a) at its upper end: where a gap is present for ant. tibial vessels

(b) at its lower end: where it gives attachment to ant. tibiofibular lig.

(3) The medial border:

- begins below the mid. condyle above & ends at the med. malleolus below.

- it is distinct only in its middle $\frac{1}{3}$.

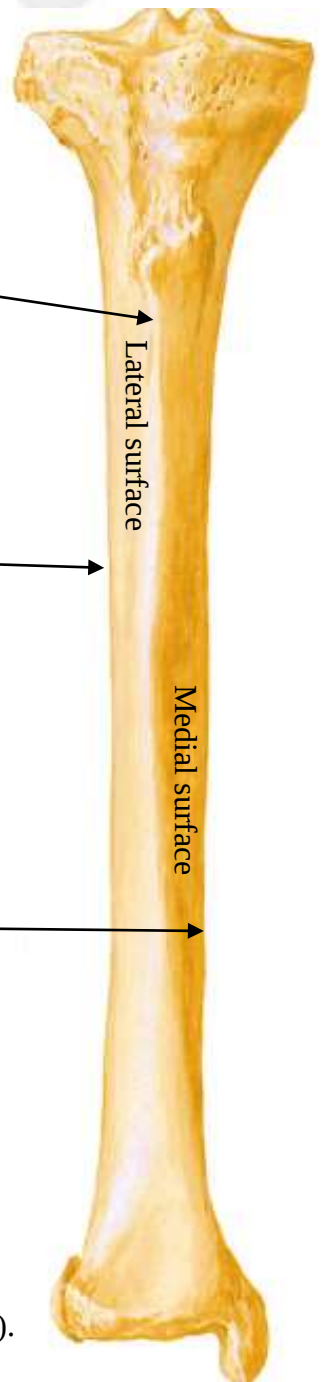
(4) The lateral surface:

lies between the ant. & interosseous borders

(5) The medial surface:

Lies between the ant. & med. Borders

- It is subcutaneous except its upper, most part to which is inserted 3 muscles. (S.G.S).



(6) The posterior surface:

- Lies between the interosseous & medial borders
- it presents 2 lines & nutrient foramen:

(a) The soleal line:

extends from the fibular facet obliquely downwards & medially to the junction between the upper $\frac{1}{3}$ & $\frac{1}{3}$ of the med. border

(b) The vertical line:

extends from the middle of the soleal line downwards dividing the post. surface below the soleal line into 2 parts (med.& lat.)

(c) Nutrient foramen: is present at the upper end of the vertical line

N.B: it is the largest nutrient foramen in the body.



The Lower End of Tibia

*it is thick & has 5 surfaces:

(1) Lat. surface: has fibular notch for the lower end of fibula

- the floor of the notch gives attachment to interosseous tibiofibular lig..
- to the ant. & post. borders of the notch are attached the ant. & post. tibiofibular ligaments of the inf. tibiofibular joint (fibrous joint)

(2) Med. Surface: projects down forming the med. malleolus which has a groove on its back for 2 muscles (tibialis post, flex. digit. longus)

- the lower border of the med. malleolus gives attachment to the deltoid lig.

(3) Ant. surface: is smooth & continuous above with the lat. surface of the shaft

(4) Post. Surface: has a faint groove for flexor hallucis longus tendon

(5) Inf. surface: shows a concave 4 sided articular surface which, together with the lat. aspect of the med. malleolus, articulate with the upper surface of talus (ankle joint)

Subcutaneous Parts of Tibia

- | | |
|-------------------------------|------------------------|
| (a) the med. & lat. condyles. | (b) tibial tuberosity. |
| (c) shin & med. Surface. | (d) med. Malleolus |

Ossification of Tibia

- | | |
|--|---|
| (1) A primary center for the shaft. | (2) a secondary center for the upper end. |
| (3) secondary center for the lower end | |

Ligaments & Muscles Attached to Tibia

(I) The Upper End:

- (1) structures attached to the anterior & posterior **intercondylar area**: see page 21
- (2) **iliotibial tract**: attached to the lat. surface of the lat. condyle
- (3) **patellar lig**: attached to the tibial tuberosity
- (4) **semimembranosus**: inserted into groove on the back of the med. condyle
- (5) **capsule** of the knee: attached around the articular surface of both condyles.

(II) The Shaft:

(A) Medial surface: its upper part gives attachment to the following (arranged from before backwards):

- (1) insertion of sartorius muscle (S)
- (2) insertion of gracilis muscle (G)
- (3) insertion of semitendinosus muscle (S)
- (4) med. Ligament of the knee joint (L)

(B) Lateral surface:

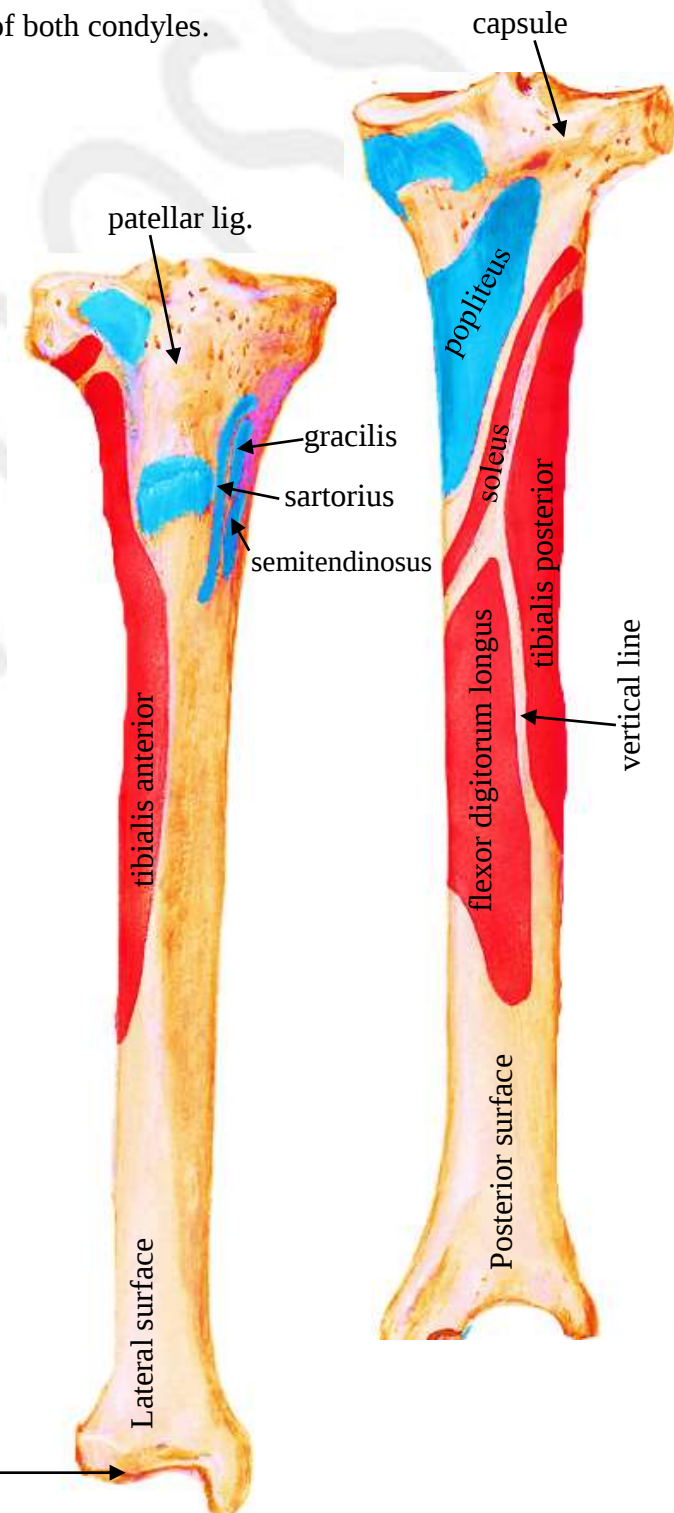
Tibialis ant. muscle arises from its upper $\frac{2}{3}$

(C) Posterior surface:

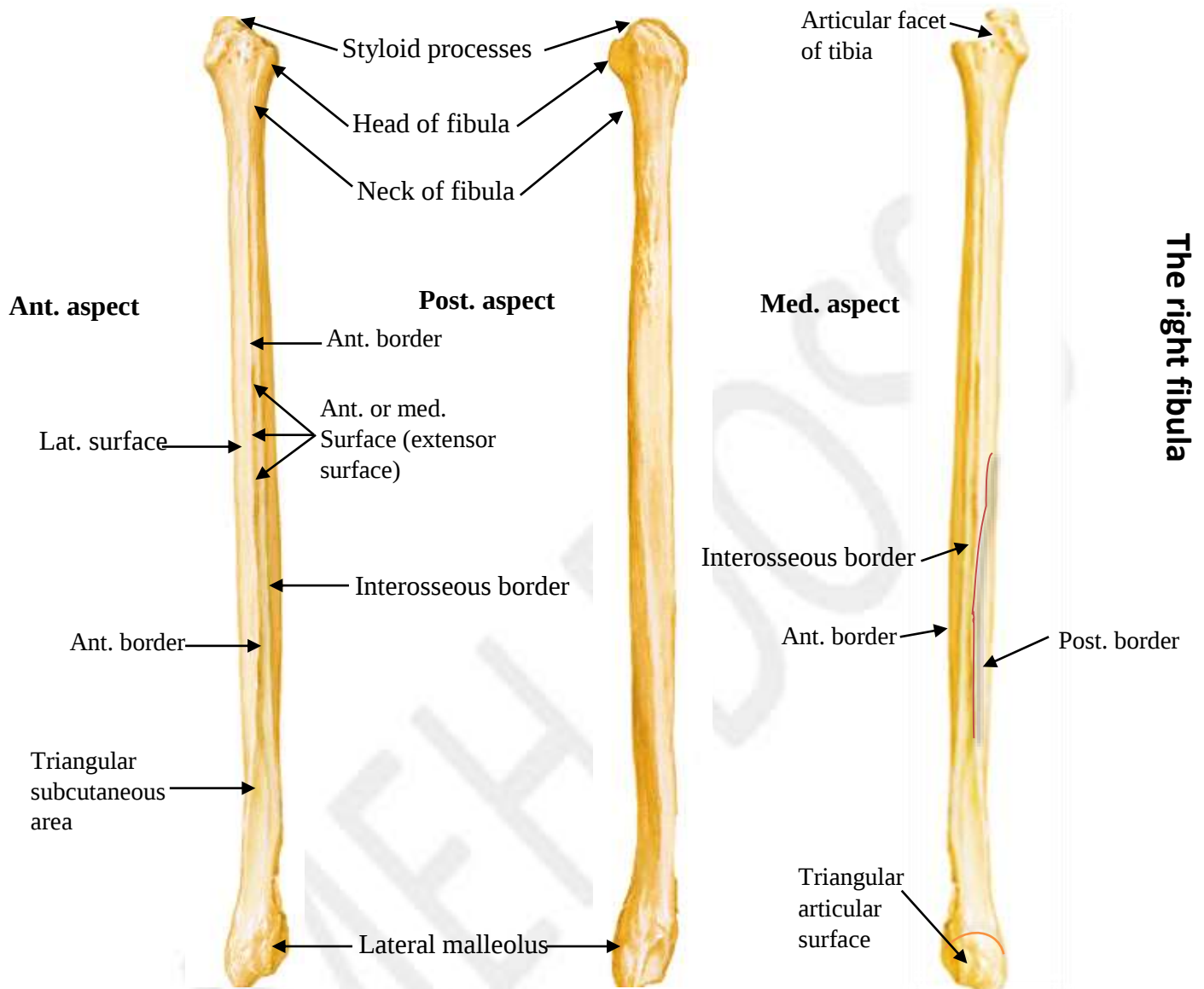
- (1) popliteus m.: inserted into the upper part of the post. surface (above the soleal line)
- (2) soleus m.: arises from the soleal line & the middle $\frac{1}{3}$ of the med. border
- (3) flexor digitorum longus: arises below the soleal line & med. to the vertical line
- (4) Tibialis posterior: arises below the soleal line & lat. to the vertical line.

The Lower End of Tibia

- (1) capsule of the ankle joint: attached around the articular surface of the lower end.
- (2) ligament of inf. tibiofibular joint (ant., post. & interosseous): attached to the fibular notch
- (3) deltoid lig.: attached to the lip of the medial malleolus.



The Fibula



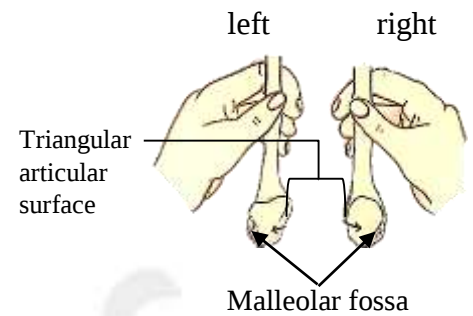
- * **Type:** it is very thin long bone.
- * **Site:** it is the lateral bone of the leg.
- * **Functions:** (1) gives origin to many muscles of the leg (8)
 (2) forms part of the ankle joint
 (3) its lower end forms a pulley for tendons of peroneal muscles.

N.B: the fibula does not share transmission of body weight because it doesn't articulate with the femur

- * **Ossification:** - one. 1ry centre for the shaft
 - two 2ry centres for the 2 ends

* How to know the sides of the fibula (Right or Left)?

- (1) the upper end is bulky & formed of head & styloid process.
- (2) the lower end is compressed from side to side.
- (3) the med. side of the lower end presents triangular articular surface & a depression called malleolar fossa.
- (4) the triangular articular surface lies ant. to the malleolar fossa.



N.B:

A simple method to identify the side of the fibula is look to the med. side of the lower end:

- if the malleolar fossa lies to the Rt → it is the Rt. fibula
- if the malleolar fossa lies to the Lt → it is the Lt. fibula.

General Features of the Fibula

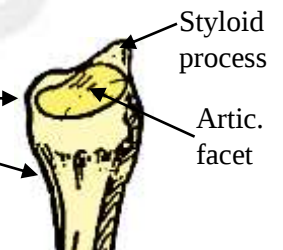
1-The upper end

* The Head: has 2 features:

- (1) Styloid process: projects upwards from the post. lat. aspect of the head.
- (2) Articular facet: for articulation with the lateral condyle of tibia.

* The Neck:

- it is the constriction just below the head.
- it is related laterally to the lat. popliteal (common peroneal) nerve.



II-The Shaft

has 3 borders:

- anterior
- interosseous
- posterior

& 3 Surfaces:

- ant. (med)
- lat.
- post.

(1) Anterior border:

- begins below from the apex of the triangular subcutaneous area on the lat. surface of the lower end of fibula.

(2) Interosseous border:

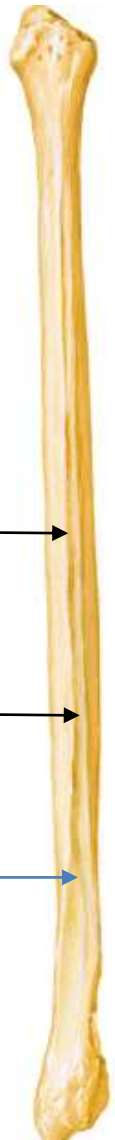
- Lies close to the ant. border & may fuse with it in the upper part of the shaft.

(3) Posterior border:

- extends from the back of the lat. malleolus to the back of the head.

(4) Anterior surface: (sometimes called medial or extensor surface):

- lies between the ant. & interosseous borders.
- it is a very narrow surface especially in the upper part where it forms a line.



(5) Lateral (peroneal) surface:

- lies between the ant. & post. borders & is a wide surface.
- its lower $\frac{1}{4}$ faces backwards & is continuous with the back of lat. malleolus.

(6) Posterior surface (flexor surface):

- lies between the interosseous & post. borders.
- it is divided into ant. & post. parts by a **ridge** called the **medial crest**.

Lower End of Fibula

- it is called lateral malleolus.
- it projects downwards more than the med. malleolus of tibia.
- its **ant. surface**: is rough (gives attachment to ant. tibiofibular lig.).
- its **post. surface**: presents a groove for peroneus longus tendon.
- its **lat. surface**: forms the lower part of the triangular subcutaneous area.
- its **medial surface** presents:

-anteriorly: **triangular articular facet** for articulation with lat. surface of talus.

-posteriorly: a depression below & behind the facet called **malleolar fossa**,

which gives attachment to 2 ligaments: (1) post. tibiofibular lig. (2) post. talofibular lig.

Subcutaneous parts of fibula:

- (1) the head.
- (2) the lateral malleolus.

Particular Features**I- Upper end:**

- (1) Biceps **muscle**: inserted into the lat. aspect of the head.
- (2) Lateral **ligament** of knee joint: attached to the head of fibula deep to the biceps tendon.
- (3) Lat. popliteal **nerve**: curves around the lat. aspect of the neck.
- (4) circumflex fibular **artery**: related to the post. aspect of the neck.

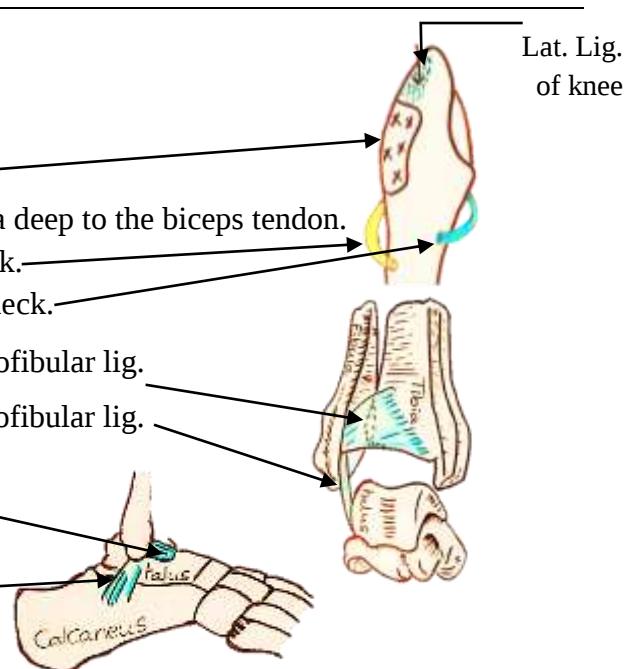
II- Lower end:

(A) **Medial surface**: malleolar fossa: $\rightarrow$ its upper part: post. Tibiofibular lig.

$\rightarrow$ its lower part: post. talofibular lig.

(B) **Anterior surface**: to it is attached the ant. talofibular lig.

(C) **Inferior border**: gives attachment to calcaneofibular lig.



II- Muscles Attached to the she Shaft

(A) Ant. or med.(extensor) surface:

1. Ext. digitorum longus: arises from the upper $\frac{3}{4}$.
2. Ext. hallucis longus: arises from the middle $\frac{2}{4}$.
3. Peroneus tertius: arises from the lower $\frac{1}{4}$.

(B) The lateral (peroneal) surface:

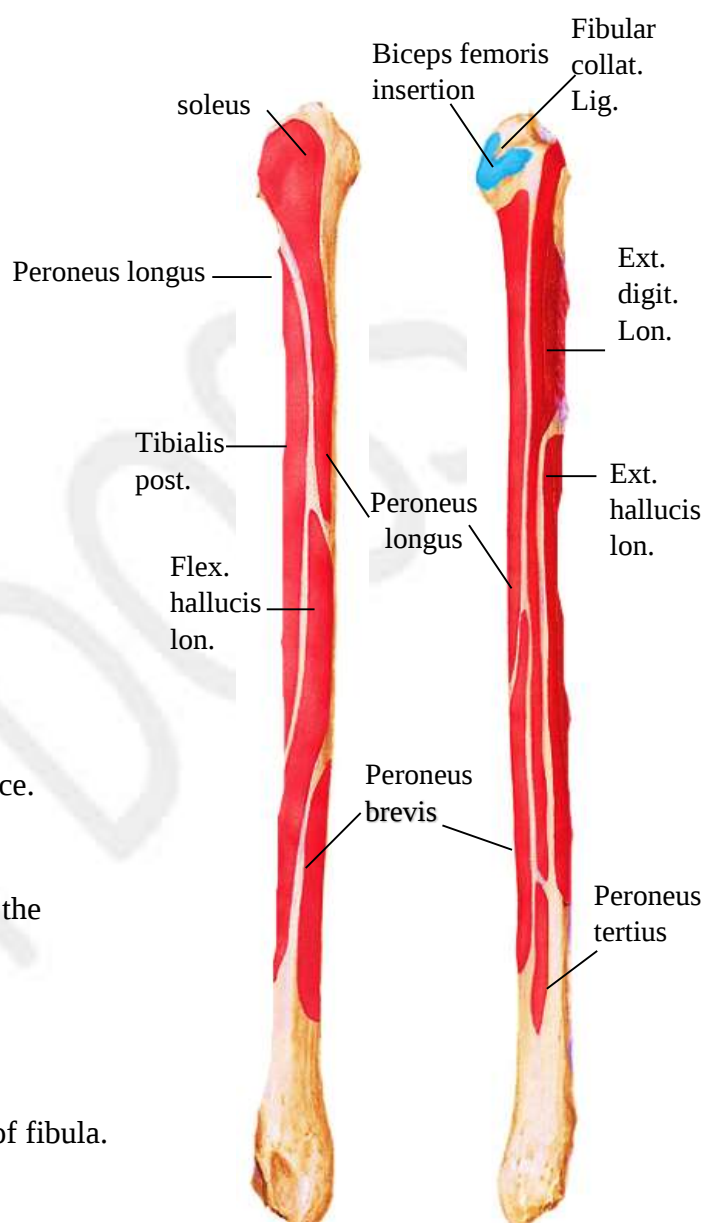
1. peroneus longus m.: arises from its upper $\frac{2}{3}$.
2. peroneus brevis m.: arises from its lower $\frac{2}{3}$.

(C) the posterior (flexor) surface:

1. soleus m.: arises from its upper $\frac{1}{3}$.
2. flexor hallucis longus: arises from the post. surface.
lat. to the med. crest.
3. Tibialis post.: arises from the post. surface med.to the
medial crest.

N.B:

Biceps femoris m.is inserted into the lat. aspect of the head of fibula.



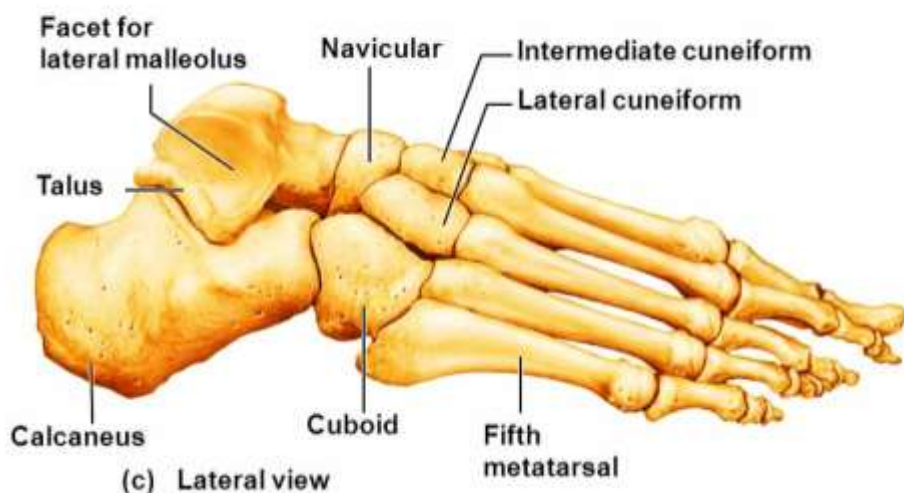
Articulations of the fibula:

Post. aspect

Ant. aspect

1. the head of fibula articulates with the lat. condyle of tibia in the sup. tibiofibular joint (synovial-plane).
2. the rough area above the med. side of the lower end articulates with the fibular notch of tibia in the inf. tibiofibular joint (fibrous joint).
3. The triangular articular facet on the med. side of the lower end articulates with the lat. side of the talus in the ankle joint (hinge synovial joint)

The Skeleton of Foot



Tarsus (7bones)	Metatarsus	Phalanges
Talus calcaneus cuboid Navicular 3cuneiform bones: med. intermediate lat.	5 short long bones numbered 1 to 5 from medial to lateral	2- for the big toe (proximal & distal). 3- for each of the lat.4 toes (proximal, medial, distal).

(A) Tarsal bones

(1) Talus:

- * **Site:** it is the uppermost tarsal bone, lying above calcaneus.
- * **Structure:** it is formed of head, neck & body:

(a) The head: it has a hemispherical anterior end for articulation with the navicular bone.

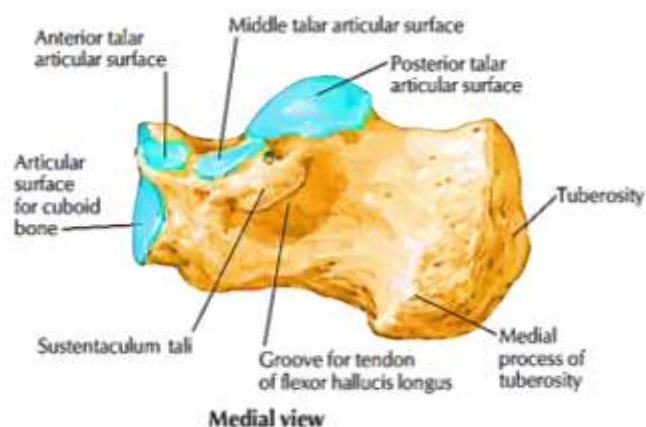
(b) neck: it is the constricted part behind the head.

(c) body: its upper surface articulates with the lower end of tibia & is called the **trochlea**.

- its med & lat. surface articulate with the 2 malleoli.
- its post. surface shows 2 tubercles (med. & lat.).
- its inf. surface shows 3 facets (one on the body, one on the neck & one on the head) for articulation with the calcaneus.

(2) Calcaneus (heel bone):

- * **Site:** below talus, it is the most post. tarsal bone.
- * **Its upper surface shows:** (a) 3 articular facets for talus.
(b) sustentaculum tali: a shelf-like process projecting medially.
- * **Ant. end:** having an articular facet for cuboid.
- * **Med. surface:** showing a groove below the sustentaculum tali.
- * **Post. end:** called the calcanean tuberosity.



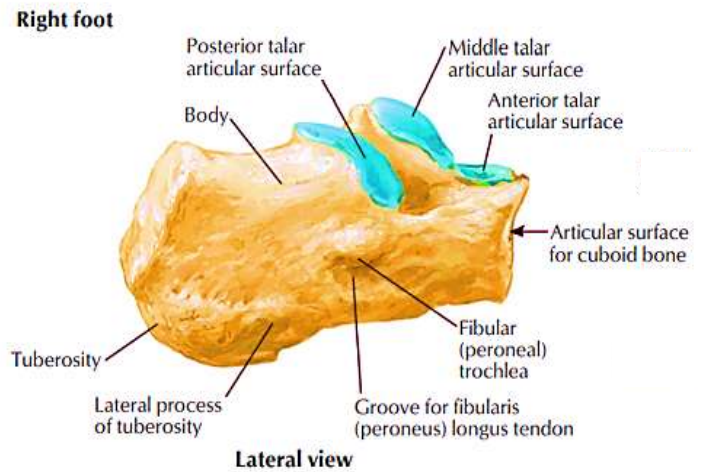
N.B: the post. end of calcaneus has:

- a) upper smooth part (related to bursa)
- b) middle rough part (for insertion of tendo calcaneus)
- c) lower subcutaneous part

* **Its lat. surface** a small tubercle (peroneal tubercle) which separates the tendon of peroneus longus & brevis

* **Its plantar surface** shows 3 tubercles:

- med. & lat. calcaneal tubercles at the post. end
- an ant. tubercle at the ant. end



(3) Cuboid bone:

- It articulates posteriorly with ant. end of calcaneus.
- It articulates anteriorly with bases of 4th & 5th metatarsal bones.
- Its plantar surface shows a groove for peroneus longus tendon.

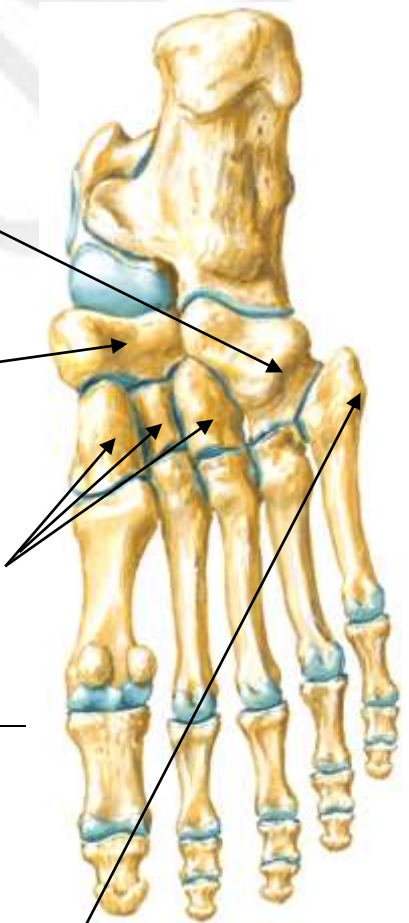
(4) Navicular bone:

- Its post. concave surface articulates with the head of talus.
- Its ant. convex surface articulates with 3 cuneiform bones.
- Its med. surface presents tuberosity of navicular bone.

(5), (6), (7) Med., intermediate & lat. cuneiform bones

- their post. concave surface articulates with the navicular bone.
- Their ant. convex surface articulates with the bases of med. 3 metatarsal bones.

N.B: the med. cuneiform is the largest while the intermediate is the smallest & is wedge-shaped



B- Metatarsal bones

- Arranged: 1st, 2nd, 4th & 5th from med. to lat.
- each one has: (a) base proximally (b) head distally (c) shaft in between
- The 1st is the thickest Metatarsal bone
- The base of the 5th has a projection called tuberosity of base of 5th Metatarsal
- The bases of the 1st, 2nd & 3rd Metatarsal bones articulate with the 3 cuneiform bones while the bases of the 4th & 5th Metatarsal bones articulate with the cuboid bone.

C- The phalanges (14)

- 2 for the big toe: proximal & distal
- 3 for each of the lat. 4 toes: proximal, middle & distal
- Each phalanx is composed of:
 - (a) proximal end or base
 - (b) shaft (c) distal end or head

Anteromedial Aspect of the Thigh

1- superficial fascia

* **structure:**

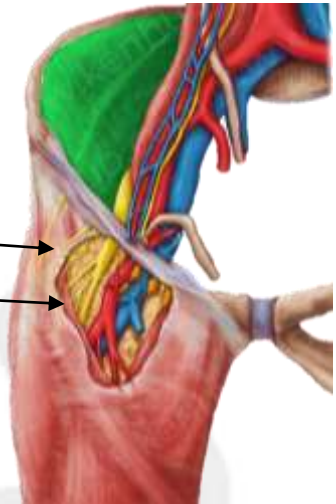
- it is differentiated into:

(1) superficial fatty layer

(2) deep membranous layer

The 2 layers are continuous with the corresponding layers in the ant. abdominal wall.

- Between the 2 layers lie the superficial nerves, vessels & L.Ns in the upper part of the thigh.



N.B: the deep membranous layer is firmly attached to the deep fascia of the thigh along a line just below the inguinal lig. This fusion prevents the escape of urine to the thigh if the penile urethra is injured.

- * **Contents of the superficial fascia:** see roof of femoral $\triangle$ (p. 49)

2- Deep fascia (Fascia Lata)

* **Definition:**

It's a very strong fibrous sheet that envelope the whole thigh like a stocking extending from the root of the line above to the knee below

* **Attachment:**

(A) **superiorly:** attached to the hip bone & its ligaments as follows

- (1) **in front:** attached to the inguinal lig. & symphysis pubis.
- (2) **laterally:** attached to the outer lip of the iliac crest
- (3) **behind:** attached to the back of sacrum & coccyx, sacrotuberous lig.
- (4) **medially:** to the conjoined ischio-pubic ramus

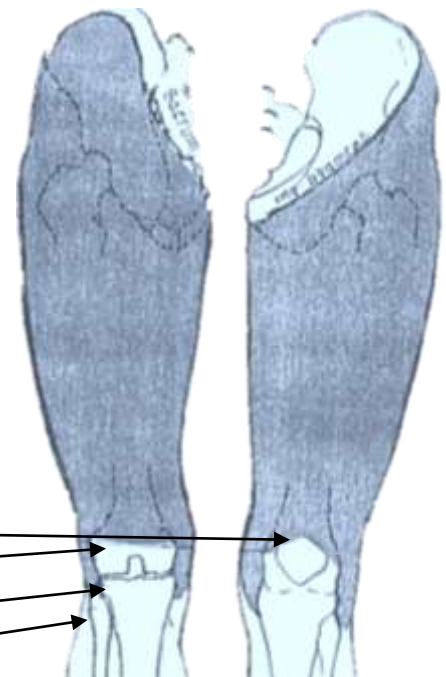
(B) **Inferiorly:** it's attached to the bony prominences around the knee i.e.:

(1) the patella

(2) the 2 femoral condyles

(3) the 2 tibial condyles

(4) the head of fibula



* Thickenings of fascia lata:

The fascia lata varies in thickness in the different parts of the thigh:

- it's thin on the med. & post. aspect.
- It's very thick on the lat. aspect forming the iliotibial tract.

Iliotibial Tract

* **definition:** it's a thickened band of fascia lata 1-2 cm wide lying on the lat. aspect of thigh.

* **Attachment:**

(1) Above: to the tubercle of iliac crest.

(2) Below: it is attached to:

- ant. part of lat. condyle of tibia
- lat. border of the patella.
- head of fibula.
- capsule of the knee joint.

* Structures attached to the iliotibial tract:

- (1) the insertion of tensor fascia lata muscle anteriorly.
- (2) the attachment of superficial $\frac{3}{4}$ of **gluteus maximus** m. posteriorly.
- (3) the lat. intermuscular septum: **to its deep** surface.

* Functions of the iliotibial tract:

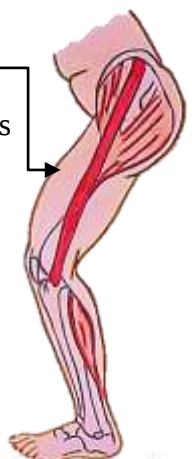
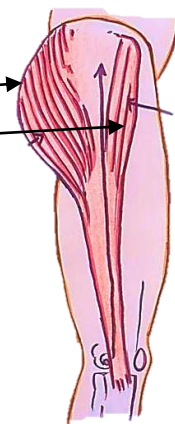
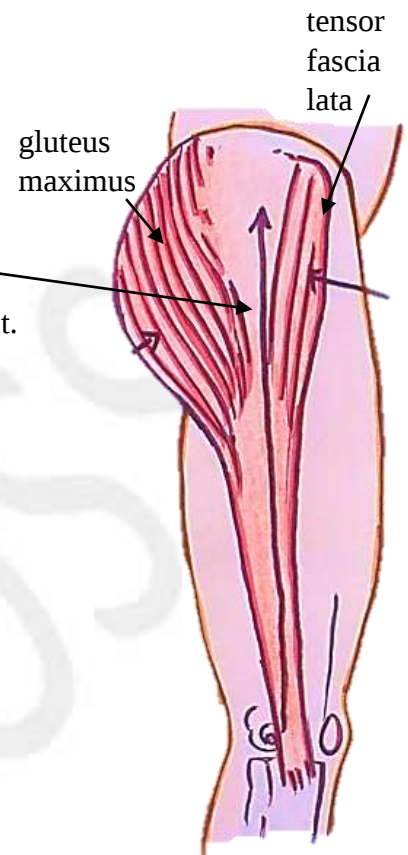
(1) extends **(prolongs) the insertion** of gluteus maximus & tensor fascia lata muscle downwards to reach below the knee joint. This allows the 2 muscles to act on both hip & knee joint.

(2) **when the knee is straight** the tract passes in front of the axis of flexion, thus it maintains the knee in the extended position.

(3) **In leaning forward** with the knee slightly flexed, the iliotibial tract is the only antigravity force which supports the knee.

(4) **in rising from sitting position**, the pull of the iliotibial tract elongates the powerful gluteus maximus m., which contract more forcibly as the movement proceeds (according to starling law).

* **Nerve supply of iliotibial tract:** lat. Cut.n. of the thigh.



Saphenous opening

It is an oval opening in the fascia lata in the upper part of the front of the thigh.

* **Site:** its center lies 1.5 inches below and lat. to the pubic tubercle.

* **Size:** 3cm × 1.5 cm.

* **Margins:** it has sharp upper, lateral and lower margins which form the falciform margin of the saphenous opening. The med. margin is ill defined.

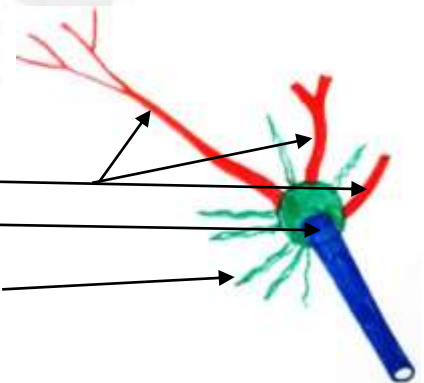
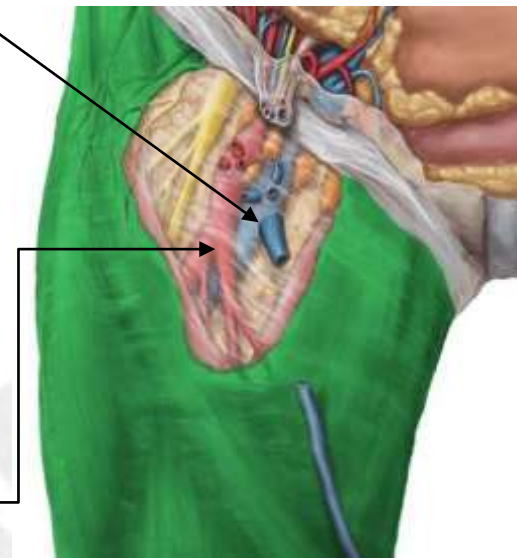
* **Overlying fascia:** the opening is closed by a thin layer of perforated fascia called **cribriform fascia**.

* **Underlying structures:**

- (1) the femoral a: lies behind the lat. margin of the opening.
- (2) the femoral v.: behind the centre of the opening.
- (3) femoral canal: behind the medial part of the opening

* **Structures passing through the opening:**

- (1) superficial inguinal arteries (from femoral a.)
- (2) great saphenous v. (to end in the femoral v.)
- (3) lymphatic vessels passing from the superficial inguinal LNs to the deep inguinal L.N.S

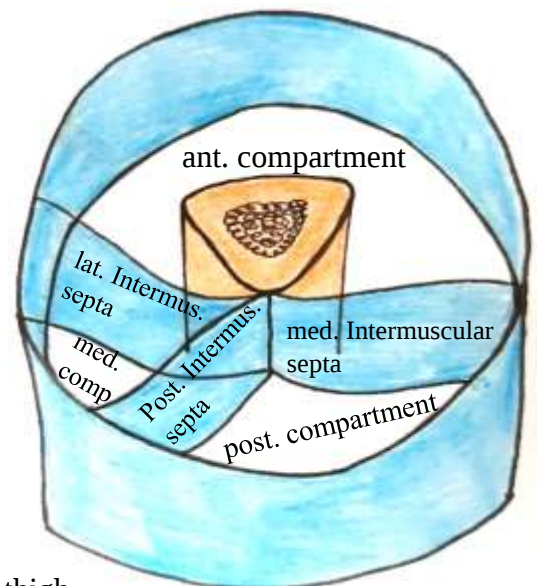


Intermuscular septa & compartments of thigh

3 intermuscular septa (med., lat. and post.) extend from the deep surface of the fascia lata to be attached to the linea aspera and the supracondylar ridges of the femur:

(1) Lateral intermuscular septum:

- it is the strongest of the 3 septa
- it extends from the gluteal tuberosity above to the lat. supracondylar ridge below.
- it is attached laterally to the iliotibial tract.
- it is attached medially to the linea aspera.
- it separates the ant. compartment from the post. compartment of the thigh.



(2) Medial intermuscular septum:

- it is thinner and shorter than the lat. septum, being well developed below.
- it extends from below the lesser trochanter down to the med. supracondylar ridge.
- it separates the ant. compartment from the med. compartment.

**(3) Posterior intermuscular septum:**

- it is the thinnest of the 3 septa and may be absent.
- it lies between the med. and post. compartment of the thigh

Compartments of the Thigh

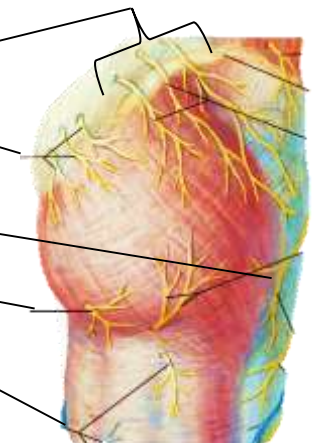
Compartment	Muscles	nerve
Anterior	-Extensors of the knee joint. Flexors of the hip joint.	Femoral nerve.
Medial	Adductors of the hip joint	Obturator nerve
posterior	Flexors of the knee (hamstring muscles)	Sciatic nerve

Gluteal Region*** Extensions:**

- (1) **superiorly:** the iliac crest
- (2) **medially:** the natal cleft
- (3) **laterally:** line between A.S.I.S and greater trochanter
- (4) **inferiorly:** a transverse crease called the gluteal fold
(it does not correspond to lowerborder of gluteus maximus muscle).

**Cutaneous Nerve of Gluteal Region**

- (1) the upper and ant. parts are supplied by the lat. cut. brs. of the subcostal (T12) and iliohypogastric (L1) nerves.
- (2) the upper and post. parts are supplied by:
 - post. 1ry rami of L1, 2, 3
 - post. 1ry rami of S1,2,3.
- (3) the lower and ant. parts are supplied by brs. from post. divisions of lat. cut. n. of the thigh (L2,3)
- (4) the lower and post. parts are supplied by:
 - perforating cut. n. (S2,3).
 - brs. of post. cut. n. of thigh (S1,2,3).



Muscles of the Gluteal Region

A- Tensor fascia

lata muscle.

B- the 3 gluteal muscles:

- (1) gluteus maximus
- (2) gluteus medius
- (3) gluteus minimus

C- 6 lat. rotators:

- (1) piriformis.
- (2) obturator internus.
- (3) obturator externus.
- (4), (5) 2 gemilli (sup. and inf.)
- (6) quadratus femoris

Tensor Fascia Lata M.

- * **Origin:** from the ant. 5 cm of the outer lip of the iliac crest (Just behind the a.s.i.s)
- * **Insertion:** into the ant. border of the iliotibial tract

N.B: the tract splits into 2 lamellae which enclose the muscle.

- * **N. Supply:** sup. gluteal n. (L4,5 and S1)
- * **Action:**
 - (1) it is a tensor of the fascia lata and iliotibial tract.
 - (2) maintains the erect posture by steadying the pelvis on the head of femur and steadying the femur on the tibia
 - (3) helps abduction of the hip.
 - (4) helps extension of the knee.



Gluteus Maximus M.

- * It is a thick powerful quadrilateral m. formed of coarse parallel fibers which run downwards and laterally.
- * **Origin:**

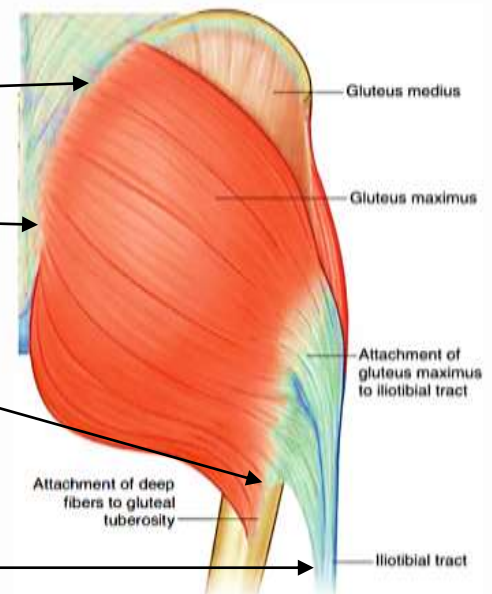
- (1) gluteal surface of ilium behind the post. gluteal line.
- (2) back of lat. mass of sacrum.
- (3) back of the sacrotuberous lig.

- * **Insertion:**
 - (1) its deep $\frac{1}{4}$: into the gluteal tuberosity of femur
 - (2) its superficial $\frac{3}{4}$: into the post. border of the iliotibial tract.

- * **N. Supply:** inf. gluteal n. (L5, S1,2).
- * **Action:**

(A) Acting from above:

- (1) it is the main extensor of the hip joint particularly when force is needed e.g. in rising from sitting position, in climbing upstairs and running.



(2) it is a strong lat. rotator and abductor of thigh.

(3) it tightens the iliotibial tract thus helping to extend the knee and steady femur on tibia .

(B) Acting from below: it can raise the body from stooping position (acting with hamstring)

Structures Under Cover of Gluteus Maximus

(Deep Relation of Gluteus Maximus)

(A) Bony parts:

- back of ilium and sacrum.
- greater trochanter.
- gluteal tuberosity.
- ischial tuberosity.

(B) Ligaments:

- sacrotuberous lig.
- sacrospinous lig.
- back of capsule of hip joint.

(C) Muscles:

- other 2 gluteii: glut. medius and glut. minimus
- piriformis
- obturator internus and the 2 gemilli
- quadratus femoris
- ischial part of Adductor magnus
- origin of hamstring muscles from the ischial tuberosity.

(D) Vessels:

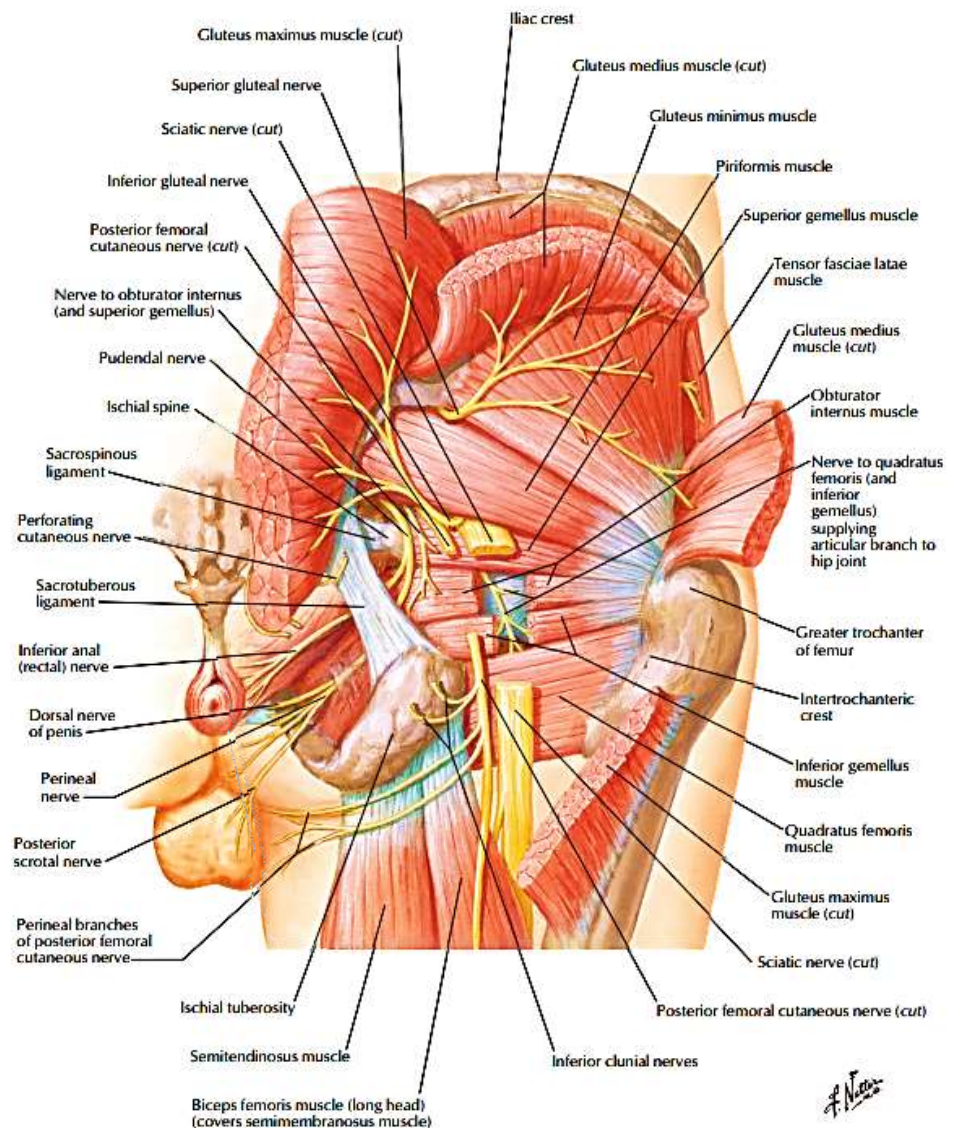
- sup. gluteal vessels.
- inf. gluteal vessels.
- internal pudendal vessels.

(E) Nerves:

- sup. inf. gluteal n.
- sciatic n. and post. cut. n. of thigh
- pudendal n. and n. to obturator internus
- n. to quadratus femoris

(F) Bursae:

- (1) bursa on greater trochanter.
- (2) bursa on ischial tuberosity.
- (3) bursa on the upper part of vastus lateralis m.



Gluteus Medius m.

* **Origin :** gluteal surface of ilium between :

- iliac crest
- post. gluteal line
- ant. gluteal line

* **Insertion :**

- Posterior angle of greater trochanter.
- oblique ridge on lat. surface of greater trochanter.

* **N. Supply :** sup. gluteal n.

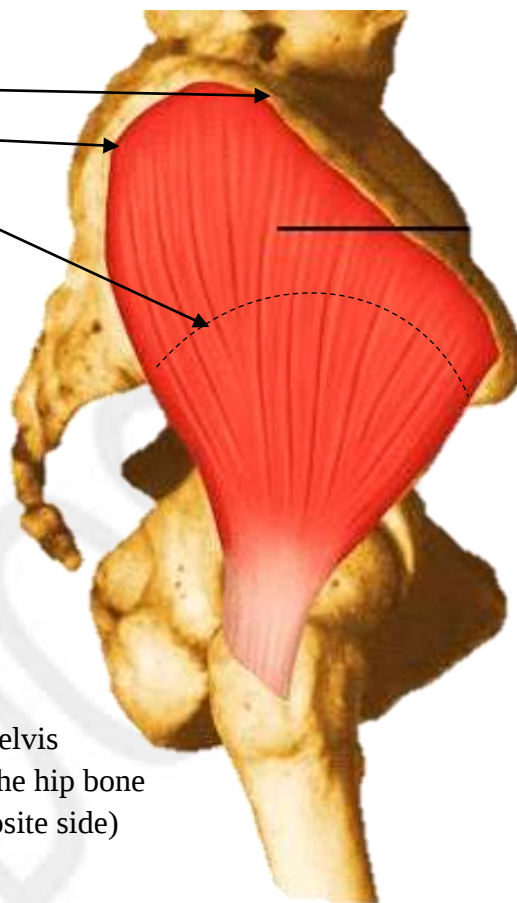
* **Action :**

(A) Acting from above:

- 1- the whole muscle: abduction of the thigh.
- 2- the thick ant. part: med. rotation of the thigh

(B) Acting from below:

together with gluteus minimus, it maintains the balance of the pelvis when the other leg is raised by exerting a powerful traction on the hip bone on the same side (thus preventing the pelvis from tilting to opposite side)



Gluteus Minimus m.

it is a fan-shaped muscle lying deep to ant. Part of gluteus medius.

* **Origin :** gluteal surface of ilium between ant. gluteal line and inf. gluteal line.

* **Insertion :** ant. surface of greater trochanter.

* **N. Supply :** sup. gluteal n.

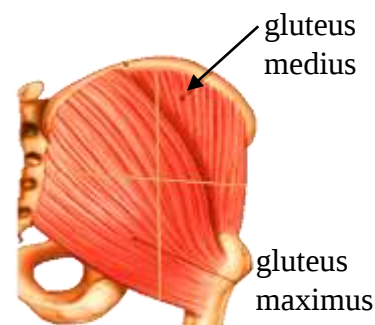
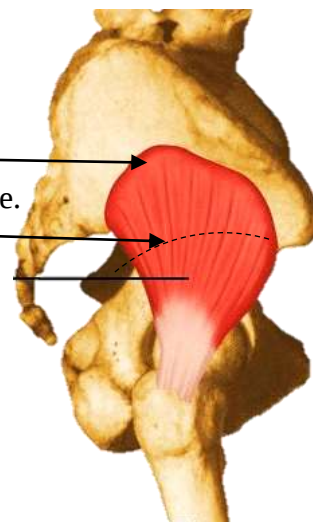
* **Action :** the same as gluteal medius.

* **Applied anatomy of gluteal muscles :**

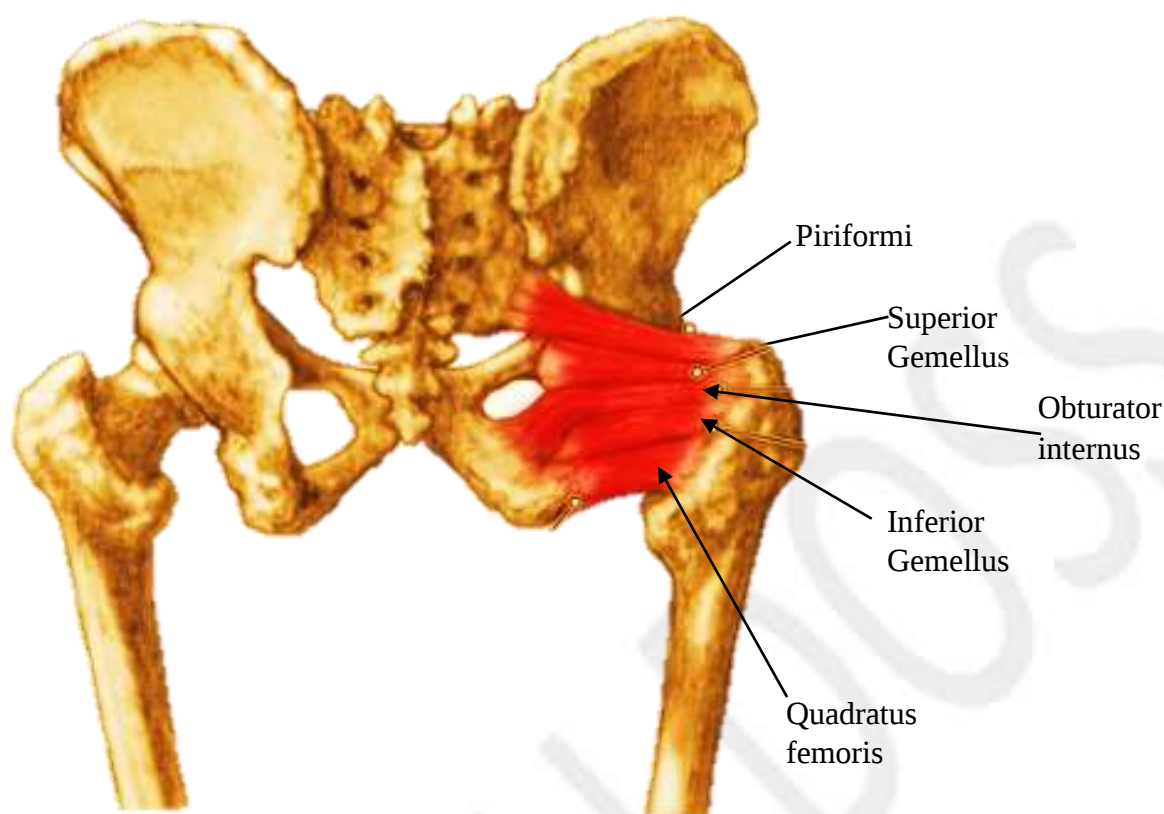
(1) intermuscular injection is given in the upper lat. quadrant of gluteal region (i.e. in the glutei medius and minimus) to avoid injury of important nerves and vessels under cover of gluteus maximus (mainly in the lower med quadrant).

(2) when gluteus maximus is paralyzed , the patient cannot stand up from a sitting position without a support.

(3) when the glutei medius and minimus are paralyzed , the patient cannot walk normally because they maintain the balance of the pelvis during walking . Their paralysis lead to **Waddling gait** (i.e. the patient sways (waddles) from side to side like the duck)

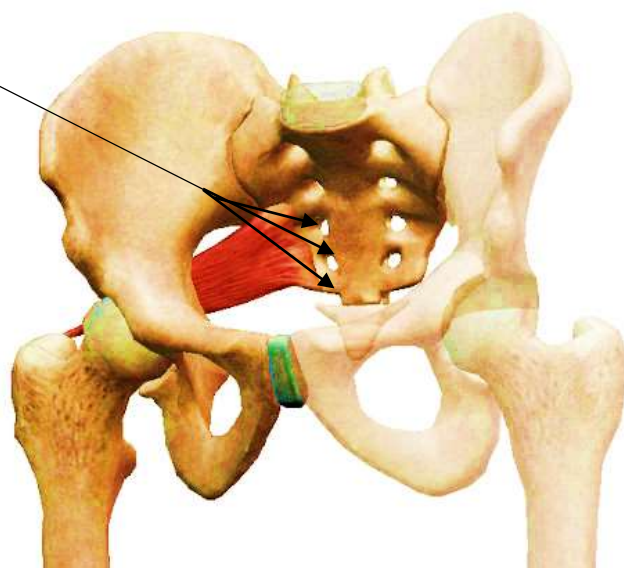


The 6 lateral rotators of the hip



(1) Piriformis m:

- * **Origin:** inside the pelvis, from the ant. surface of the middle 3 sacral pieces .
- * **Course:** it emerges from the greater sciatic foramen.
- * **Insertion:** into the upper border (top) of the greater trochanter.
- * **N. supply:** inside the pelvis, by branches from S1, S2.
- * **Action:** lateral rotation of the thigh.



* **Relations :**

- (1) in the pelvis : it is related anteriorly to the roots of the sacral plexus .
- (2) it emerges from the greater sciatic foramen dividing it into upper & lower parts (see page 40 for structures passing above & below piriformis) .

2- Obturator internus m.

* **Origin:** inside the pelvis from:

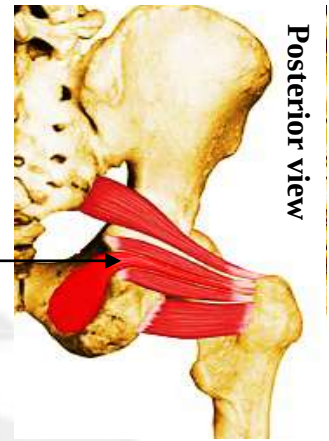
- (1) inner surface of the obturator membrane
- (2) front & side walls of pelvic cavity around the margins of the obturator foramen.

* **Course :** its tendon emerges from the pelvis through the lesser sciatic foramen, bends at right angle & runs laterally across the back of hip joint .

* **Insertion :** into the med. surface of the greater trochanter.

* **N. supply :** n. to obturator internus (from sacral plexus).

* **Action:** lat. rotation of thigh.



3- Superior Gemellus m.

* **Origin:** upper boundary of the lesser sciatic notch.

* **Insertion:** upper border of obturator internus tendon.

* **N. supply:** n. to obturator internus.

4- Inferior Gemellus m.

* **Origin:** lower boundary of the lesser sciatic notch.

* **Insertion:** lower border of obturator internus tendon.

* **N. supply:** n. to quadratus femoris m.

* **Action of the 2 Gemelli:** weak lat. rotators of the thigh.

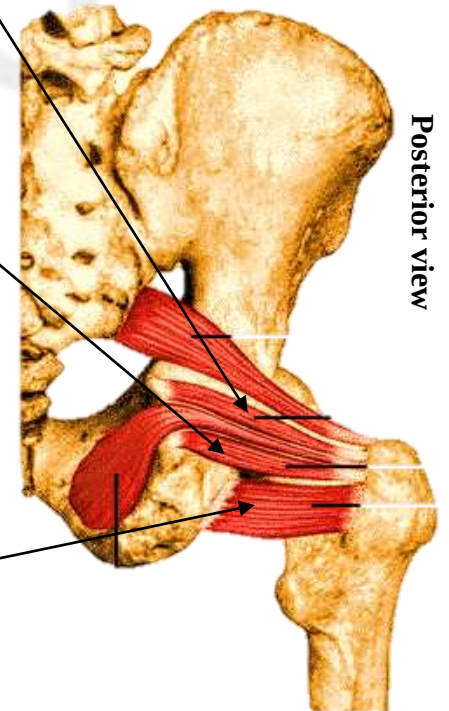
5- Quadratus femoris m.

* **Origin:** lat. border of upper part of ischial tuberosity.

* **Insertion:** quadrate tubercle of femur & the bone below it.

* **N. supply:** n. to quadratus femoris

* **Action:** lat. rotation of the thigh.



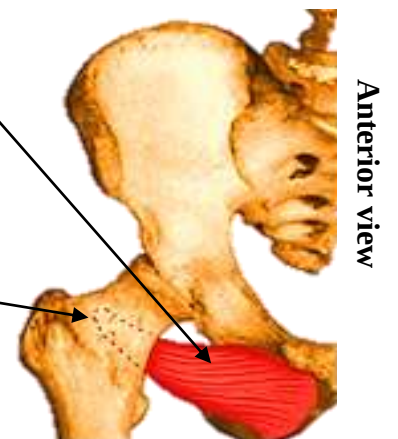
6- Obturator externus m.

* **Origin:** outer surface of the obturator membrane + the outer margins of the obturator foramen.

* **Insertion:** its tendon passes below then behind the neck of femur & hip joint to be inserted into the trochanteric fossa.

* **N. supply:** post. division of obturator n.

* **Action:** lat. rotation of the thigh.



Ligaments of the gluteal region

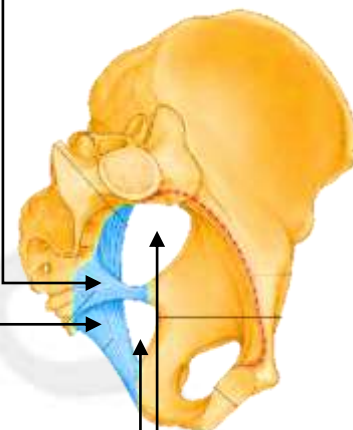
(1) Sacrospinous ligament :

- it is a short thick triangular lig. lying deep to the sacrotuberous lig.
- its apex (lat. end) is attached to the ischial spine .
- its base (med. end) is attached to the last piece of sacrum & 1st piece of coccyx.

(2) Sacrotuberous ligaments:

-it is a long strong band which is attached:

- (a) inferiorly: to the medial margin of the ischial tuberosity
- (b) superiorly: to the post. segment of the iliac crest, lat. border of sacrum and coccyx .

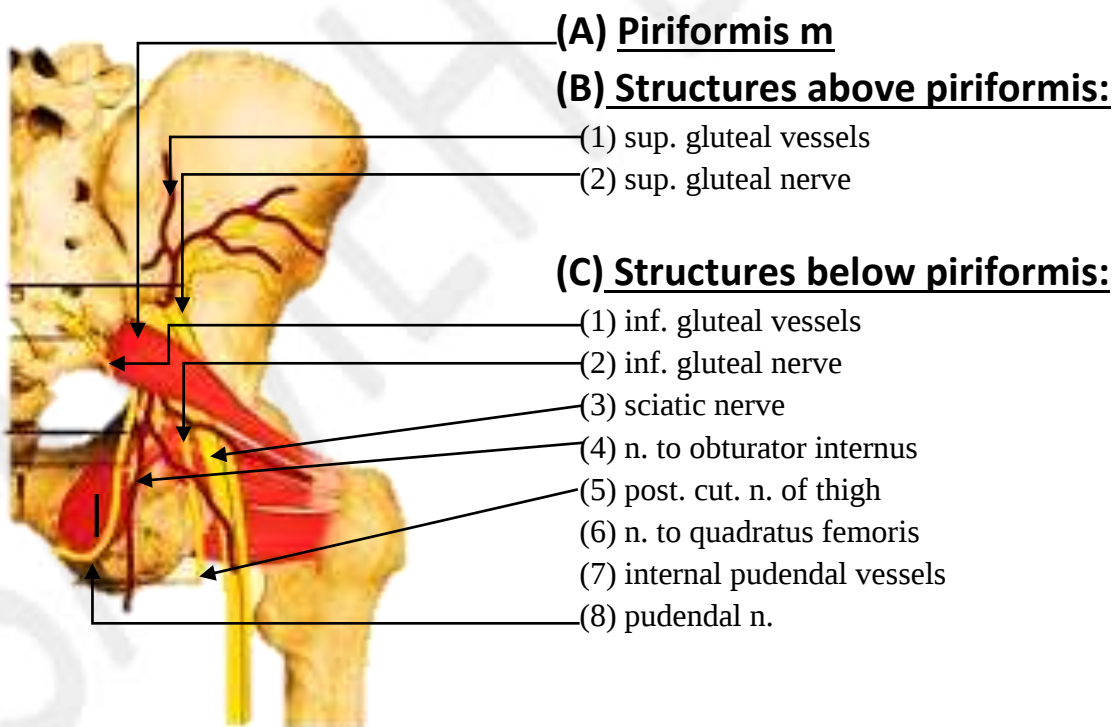


Foramina of the Gluteal region.

The sacrospinous & sacrotuberous ligaments convert:

- (a) the lesser sciatic notch into ➔ lesser sciatic foramen
- (b) the greater sciatic notch into ➔ greater sciatic foramen.

Structures passing through greater sciatic F.



Structures passing through lesser sciatic F.

- (1) Tendon of obturator internus: emerges from the pelvis to the gluteal region.
- (2) Structures emerging from the greater sciatic F. and entering the lesser sciatic foramen:
 - (a) n. to obturator internus lat.in position , crossing the ischial spine.
 - (b) int. pudendal vessels: intermediate in position, crossing tip of the ischial spine.
 - (c) pudendal n. : medial in position, crossing the sacrospinous lig .

Comment on the structures passing through greater & lesser sciatic foramen.

(1) Piriformis muscle : (see page 38)

(2) Sup. gluteal n. (L4,5,S1) :

- it is a branch of the sacral plexus
- it leaves the pelvis by passing through greater sciatic foramen above piriformis m.
- it runs forwards between gluteus medius & minimus (supplying both muscles).
- it ends by supplying the tensor fascia lata muscle.

(3) Sup. gluteal a.:

- it is a br. of post. division of internal iliac a. inside the pelvis.
- it emerges from the greater sciatic foramen above piriformis m.
- it ends by dividing into:
 - (a) superficial division : supplies gluteus Maximus m.
 - (b) deep division : subdivides into sup. & inf. brs. running between glutei medius & minimus:
 - (1) sup. br. runs along the ant. gluteal line to end at The A.S.I.S (**sharing in the anastomosis there**) .
 - (2) inf. br. runs along the inf. gluteal line to end by joining the trochanteric anastomosis (p.83).

(4) Inf. gluteal n. (L5, S1, 2):

- it is a branch of the sacral plexus.
- it leaves the pelvis by passing through greater sciatic F. below piriformis m.
- it ends by supplying the gluteus maximus m.

(5) Inf. gluteal a.:

- it is a br. of the ant. division of the internal iliac a.
- it accompanies the inf. gluteal n. (supplying gluteus maximus).
- it gives articular br. to hip joint, artery to the sciatic n. & br. to cruciate anastomosis.

(6) Sciatic nerve : (see page 99 for its course in the gluteal region).

(7) Post. cut. n. of thigh :

- it is a br. of sacral plexus which emerges through greater sciatic F. below piriformis m.
- it descends on the dorsal surface of sciatic n., covered superficially by gluteus maximus m.
- at the origin of the hamstring ,it leaves sciatic n. by passing superficial to the long head of biceps m. then continues on the back of thigh just deep to the deep fascia .

(8) N. to obturator internus (br. of sacral plexus):

- emerges from greater sciatic F. below piriformis then enters the lesser sciatic F.
- it supplies obturator internus m. + sup. gemellus m.

(9) N. to quadratus femoris: descends on the back of ischium deep to sciatic n., obt. int. & the 2 gemelli to end by supplying quadratus femoris + inf. gemellus m.

(10) Pudendal n. (br. of sacral plexus): emerges from greater sciatic f., ends lesser sciatic

(11) Int. pudendal a. (br. of ant. division of int. iliac a): it accompanies the pudendal n.

Muscles of iliac region

(1) psoas major muscles

* **Origin:** inside abdominal from

- 1) ant. surface and lower border of all lumbar transverse processes
- 2) sides of bodies of last thoracic and lumbar vertebrae and intervening intervertebral discs and tendenous arch.

* **Course:**

- it descends along the lumbar vertebrae then pelvic brim
- the lower part of the muscles leaves abd. deep to inguinal lig closely related to ilicus m and ant. to the capsule of hip joint.

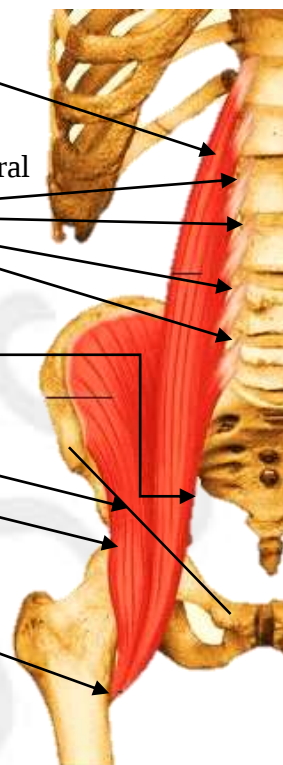
* **Insertion:** together with ilicus m. forms iliopsoas tendon insert into lesser trochanter of femur.

* **Nerve supply:** L1, 2, 3 (directly from lumbar plexus)

* **Important relations of psoas major in the thigh:**

- 1) **anteriorly:** inguinal lig. & femoral sheath
- 2) **posteriorly:** capsule of hip joint (separated from it by psoas bursa)
- 3) **medially:** pectineus m
- 4) **laterally:** iliacus m separated from it by femoral nerve.

N.B: both iliacus and psoas form the lateral part of the floor of femoral triangular.



(2) iliacus m

* **Origin:**

- 1) upper $\frac{2}{3}$ of the floor of iliac fossa + inner lip of iliac crest
- 2) iliolumbar & ant. Sacroiliac ligaments
- 3) adjoining part of ala of sacrum.

* **Insertion:** into the lateral side of psoas major tendon (forming the common iliopsoas tendon insert into the lesser trochanter)

* **Nerve supply:**

Femoral nerve (by br. arising from it side the abdomen)

* **Action of iliopsoas:**

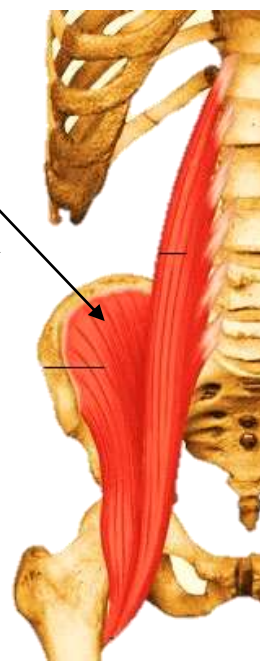
1) **acting from its Origin:**

Flexion the thigh and medial rotation

2) **acting from its insertion:**

- iliopsoas of one side: lateral. Flexion of the vertebral column.
- iliopsoas of both sides: flexion of the pelvis over the thigh (as in rising from recumbent position)

N.B: in case of fracture neck of femur, the iliopsoas produces lateral rotation of thigh



Muscles of the front of thigh

(1) Sartorius m.

(sartor = tailor)

- It is the **longest m. In the body** & is flashy from origin to insertion
- It is strap-like muscles with parallel fibers.

* **Origin:** ant. sup. iliac spine & the notch below it.

* **Insertion:** upper part of med. surface of tibia by flat tendon

* **Nerve supply:** femoral nerve.

* **Action:**

Putting the lower limb in the classical cross leg position of tailor by acting on both hip & knee joints as following:

- 1) flexion, abduction & lat. rotation of the thigh.
- 2) flexion & med. Rotation of the thigh

Sartorius, Gracilis & Semitendinosus (S.G.S) are called the (**Guy ropes**) because they arise from different areas the mobile pelvis & are inserted into the same area (in the tibia), thus they help to stabilize the mobile pelvis.

* **Important relations of sartorius:**

It's the most superficial muscles in front of the thigh.

Its upper ⅓ (oblique):

Forms the lateral boundary of femoral triangle

its middle ⅓ (oblique):

Forms the roof of the subsartorial canal.

its lower ⅓ (vertical):

Descends along the med. side of the knee.

2 nerves pierce the Sartorius m.:

(a) **intermediate cut. n. of thigh:** pierces it hand breadth below its origin

(b) **saphenous n(or its infrapatellar br):** pierces it hand breath above its insertion.

femoral triangle

femoral triangle

femoral triangle

femoral triangle

femoral triangle

femoral triangle

femoral triangle

femoral triangle

femoral triangle

femoral triangle

femoral triangle

femoral triangle

femoral triangle

femoral triangle

femoral triangle

femoral triangle

femoral triangle

femoral triangle

femoral triangle

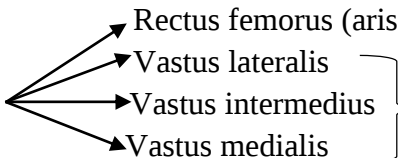
femoral triangle

femoral triangle

femoral triangle

(2) Quadriceps m.

* It is the biggest muscle in the body

* It is formed of 4 parts (heads) 

- Rectus femoris (arise from **hip bone**)
- Vastus lateralis
- Vastus intermedius
- Vastus medialis

(arise from **femur**)

A- Rectus femoris m.

* **Origin:** from the hip bone by 2 tedious heads

(1) straight head: from ant. inf. iliac spine

(2) reflected head: from a groove just above the acetabulum from the capsule of hip joint.

the two head units at acute angle to form bipennate fusiform muscle which descends in front of the thigh.

* **Insertion:** into upper border (base) of patella.

B- Vestus intermedius m.

* **Origin:** (1) upper $\frac{3}{4}$ of ant. & lat. surfaces of femur and lateral intermuscular septum of the thigh.

C- Vestus lateralis m.

* It's the largest component of quadriceps m.

* **Origin:** it had a continuous linear origin from:

- upper part of intertrochanteric line
- ant. & inf. borders of greater trochanter
- lat. lip of gluteal tuberosity
- lat. lip of upper $\frac{1}{2}$ of linea aspera.

D- Vestus medialis m.

* **Origin:** it has a continuous linear origin from:

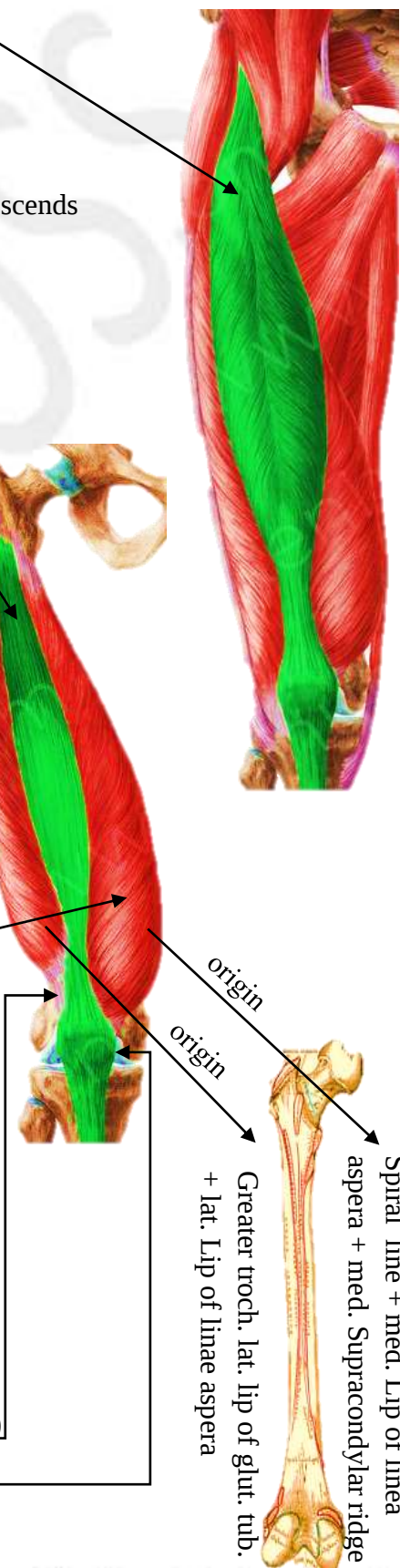
- lower part of inter trochanteric line
- spiral line
- medial lip of linea aspera
- upper $\frac{1}{2}$ of med. supracondylar ridge.

Insertion of quadriceps

(1) The 4 heads join each other forming one mass which is

insert into:

- (a) base of patella
- (b) lateral side of patella (via **lateral vastal retinaculum**)
- (c) med. side of patella (via **medial vastal retinaculum**)



2) Patellar lig. arise from the apex of the patella & go down to get final insertion in the **tibial tuberosity**.

N.B:

(1) expansion from vastus medialis & vastus lateralis go to the respective sides of fibrous

capsule of knee joint.

(2) the patella is considered as sesamoid bone in quadriceps tendon.

* Nerve supply: femoral nerve

- each head of quadriceps receives 1-3 separation branches from femoral nerve.

- the branch to vastus medialis is the **thickest** as it also carries proprioceptive fibers supplying the knee joint.

- the branch to rectus femoris carries fibers to the hip joint.

* Action of the quadriceps m.

(1) the whole quadriceps m. is the main extensor of the knee.

(2) rectus femoris: is a **strong flexor** of the hip joint (next to iliopsoas) it's also flexes the pelvis over the lower limb (it's the chief stabilizer of hip & knee joints)

(3) the distal fleshy fibers of vastus medialis (med. vastal retinaculum) stabilizes the patella by counteracting the lat. pull induced by the iliotibial tract.



Articularis genu muscle

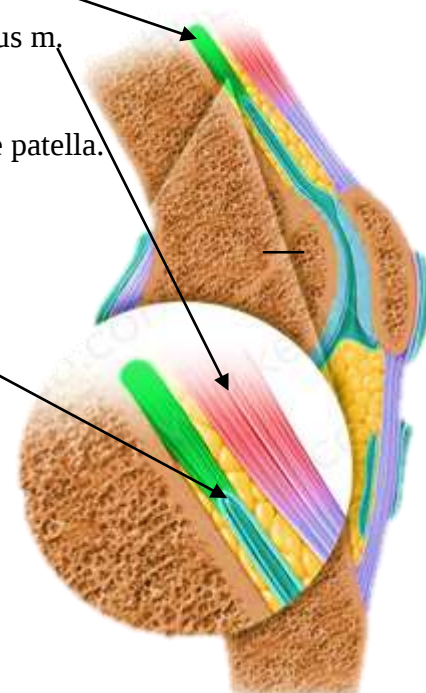
* It is a small slender muscle lying deep to lower part of vastus intermedius m.

* Origin: lower part of the ant. surface of shaft of femur 5cm above the patella.

* Insertion: upper part of synovial membrane of knee joint which bulges up as the supra patellar synovial fold.

* Nerve supply: femoral nerve (through n. to vastus intermedius).

* Action: pulls the synovial membrane upwards during extension of the knee thus preventing it from being insinuated between the articulating bones.



MUSCLES OF THE MEDIAL SIDE OF THE THIGH

* They include: gracilis, pectineus & 3 adductors (longus, brevis & magnus)

* General remarks:

(1) Arrangement: gracilis m. is the most medial muscle.

- It forms with the shaft of femur a V-shaped interval in which other muscles are arranged in 3 layers as follows:

(a) ant. layer: formed of adductor longus & pectineus

(b) middle layer: formed of adductor brevis

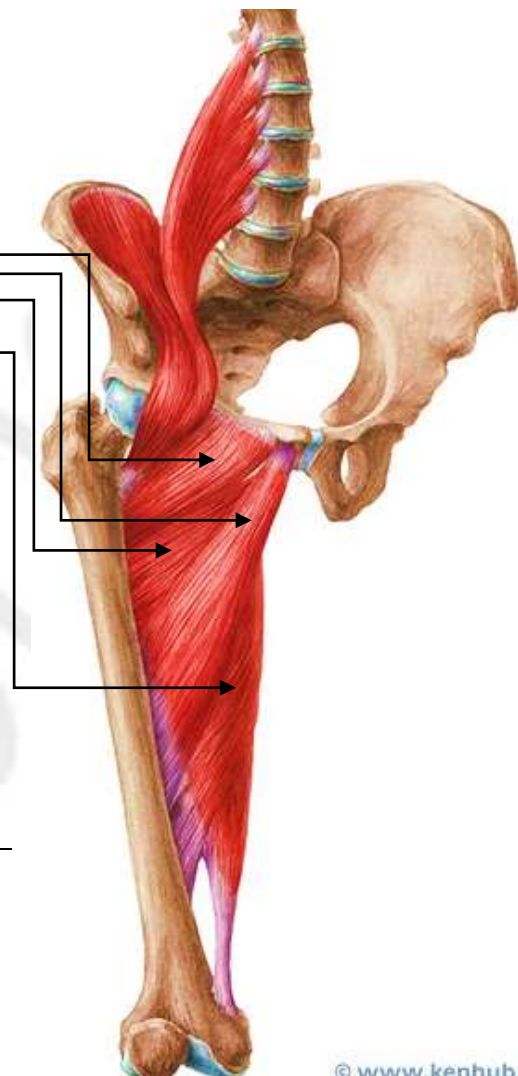
(c) post. layer: formed of adductor magnus

(2) Origin: all arise from pubis (body, Sup. ramus & inf. ramus).

(3) Insertion: all are inserted into the back of femur (linea aspera & its extension) **Except gracilis** (inserted into the tibia)

(4) N. Supply: all supplied by obturator n. **Except pectineus** (femoral).

(5) Action: all are adductors of the hip joint.



1- Gracilis muscle

* It is the most medial m. of the adductor Compartment.

* Origin :

- (1) lower part of body of pubis
- (2) inferior pubic ramus
- (3) upper part of ischial ramus.

* Insertion:

into upper part of med. surface of tibia (between the insertion of sartorius anteriorly & semitendinosus posteriorly).

* **N. Supply:** ant. division of obturator n-

* Action:

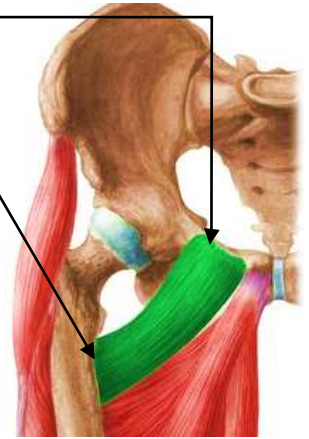
- (1) adduction of thigh
- (2) Flexion & med. rotation of knee
- (3) it is one of the 3 "Guy rope" Stabilizing the pelvis



© www.kenhub.

2- Pectineus m.

- * **Origin:** pectineal line & surface of sup. pubic ramus.
- * **Insertion :** upper $\frac{1}{2}$ of pectineal line of femur which extends from lesser trochanter to the linea aspera
- * **N. Supply:** Femoral n. (mainly) .
 - br. From obturator (or accessory obturator n.) occasionally supplies its post. part.
- * **Action:**
 - (1) adduction of the hip joint
 - (2) Flexion of hip joint (Considered as detached part of psoas).



* Imp. relations:

- (1) it forms part of the Floor of femoral A.
- (2) it is related anteriorly to the femoral sheath.
- (3) it is related posteriorly to abductor externus m.

3- Adductor longus m.

- * **Origin:** by rounded tendon from body of pubis just below pubic tubercle.
- * **Insertion:** into linea aspera (in the middle $\frac{1}{3}$ of back of shaft of femur)
- * **N. Supply :** ant. division of **Obturator n.**
- * **Action :**
 - (1) adduction of thigh
 - (2) helps flexion of thigh
 - (3) lat. rotation of thigh.*

* Imp. relations:

- (1) the muscle forms the med. part of the floor of the femoral Δ
- (2) the muscle Separates femoral vessels (ant. to it) from profunda vessels (post. to it).
- (3) its tendon of origin may be partially ossified in horse riders (rider bone).
- (4) its tendon of origin is a landmark to the pubic tubercle

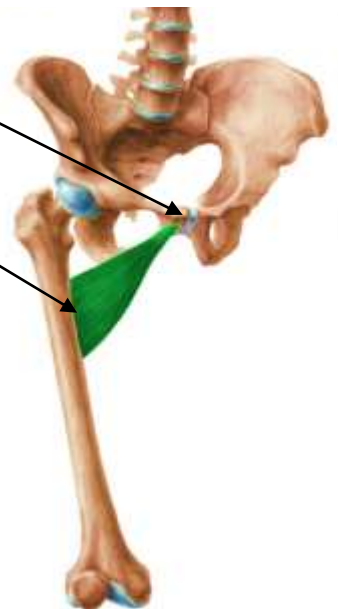


4- Adductor brevis m.

- * **Origin:** front of body of pubis & inf. pubic ramus (below origin of add. longus)
- * **Insertion:** lower part of pectineal line + upper part of linea aspera.
- * **N. Supply:** obturator n. (either the ant-or the post division).
- * **Action:-**
 - (1) adducts & helps Flexion of the thigh.
 - (2) lat. rotation of the thigh- m.*

* Imp. relations:

- (1) the muscle lies deep to adductor longus & pectineus.
- (2) the muscle lies Separates the ant-division of obturator n. (ant.to it) from post. division of obturator n. (post to it)



5- Adductor Magnus m.

- It is the biggest & most powerful adductor
- It has 2 origin, 2 insertion, 2 nerve supply & 2 actions.
- It is considered as formed of 2 parts: **pubic** & **ischial**.

I- the pubic part: arises from **pubic arch**.

Origin	Course	Insertion
inf-pubic ramus	Horizontal	- med. lip of gluteal tuberosity.
ischial ramus.	Oblique	- med. lip of linea aspera - med. supracondylar ridge

II- the Ischial Part: from **ischial tuberosity**

Origin	Course	Insertion
Lateral area of lower part of ischial tuberosity.	Vertical	adductor tubercle of femur.

N.B:

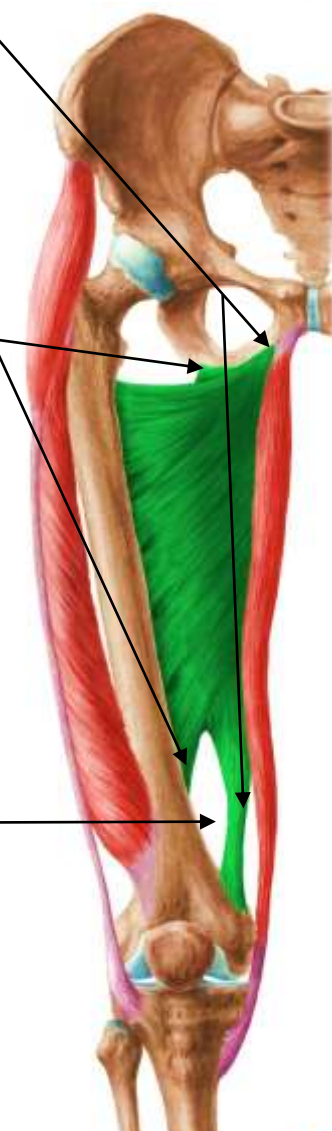
- (1) The insertion of the pubic part is interrupted by the passage of the perforating branches of the profunda femoris.
- (2) the **Adductor Hiatus** is an opening in adductor magnus lying between the lower end of the insertion of the pubic part & the lower end of the insertion of the ischial part.
 - The hiatus lies at the junction between the upper $\frac{3}{4}$ & the lower $\frac{1}{4}$, of the med. side of thigh. This opening gives passage to femoral vessels & the contents of subsartorial canal.

- * **N. Supply:**
- pubic part: obturator n. (post division)
 - ischial part: Sciatic n. (tibial part)

- * **Action:**
- pubic part: adduction & lat. rotation of the thigh.*
 - ischial part: extension of hip joint (like hamstrings).

* **Imp. relations:**

- (1) ant. surface related to:
 - Termination of profunda a. and its perforating brs.
 - Femoral a
 - Post. division of obturator n
- (2) post. surface related to: sciatic n. & anastomosis between the perforating brs. of profunda.



Femoral Triangle

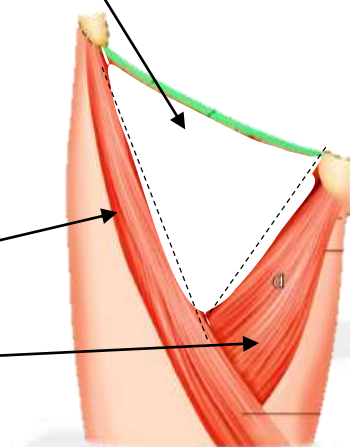
it is the largest intermuscular space in the lower limb .

* **Site:** it lies in the upper $\frac{1}{3}$ of Front of thigh just below the inguinal lig.

* **Shape:** a shallow triangular depression with base above & apex below.

* Boundaries:

- laterally: med. border of sartorius m.
- medially: lat. border of adductor longus.*
- base (above): formed by the inguinal lig. (extending from the A.S.I.S & the pubic tubercle)
- apex (below): is formed by the meeting point of the med. & lat. borders (sartorius overlapping adductor longus).



* **Roof:** is formed of:

- skin & superficial fascia with its contents of vessels, nerves & L. Ns
- deep fascia (fascia lata) containing the saphenous opening

(A) Superficial fascia of the roof:

- it is formed of superficial fatty & deep membrane layers .
- the sup. fascia Contains the following Structures:

(1) One Vein: the upper end of the great saphenous V & its tributaries.

(2) Two groups of superficial inguinal L. Ns:

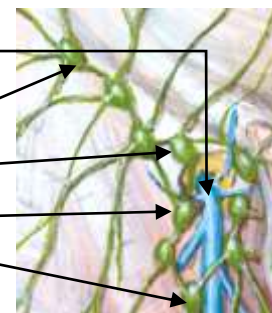
- (a) horizontal group: below & parallel to inguinal lig.
- (b) vertical group: alongside the great saphenous V.

(3) Three superficial brs. of femoral a & their accompanying veins.

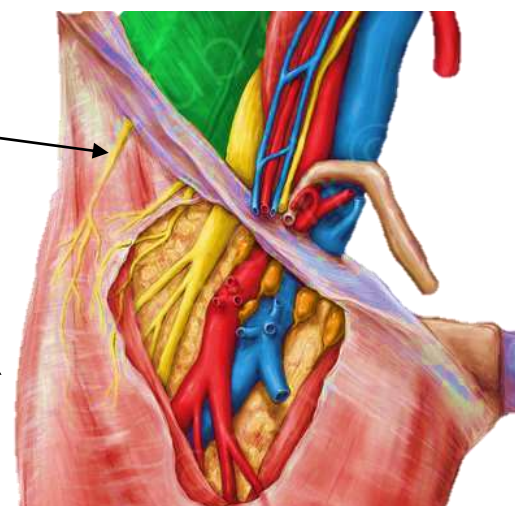
- (a) superficial epigastric a. & v.
- (b) Superficial circumflex a. & v.
- (C) superficial external pudendal a. & v.

(4) Four Superficial nerves:

- (a) ant. br. of lat. cut. n. of thigh: at the upper lat. angle of femoral Δ
- (b) femoral br. of genitofemoral n.: below the middle of the inguinal lig.
- (c) ilioinguinal n.: at the upper med. angle of femoral Δ
- (d) intermediate cut. n. of thigh: at the apex of femoral Δ



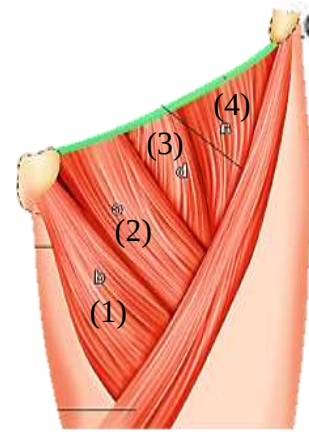
(B) Deep fascia of the roof: it is the upper of fascia lata
it contains the Saphenous opening (see page 33)
(described in detail).



* Floor of the femoral triangle:

it is formed of 4 muscles arranged from med.to lat.as follows:

- | | |
|------------------------|-------------------|
| (1) adductor longus m. | } Slope laterally |
| (2) pectineus m. | |
| (3) psoas major m. | } Slope medially |
| (4) iliacus m. | |



N.B: A vertical gutter-like groove is formed between the 2 medial sloping & the 2 lateral sloping muscles.

This groove lodges the contents of the femoral Δ

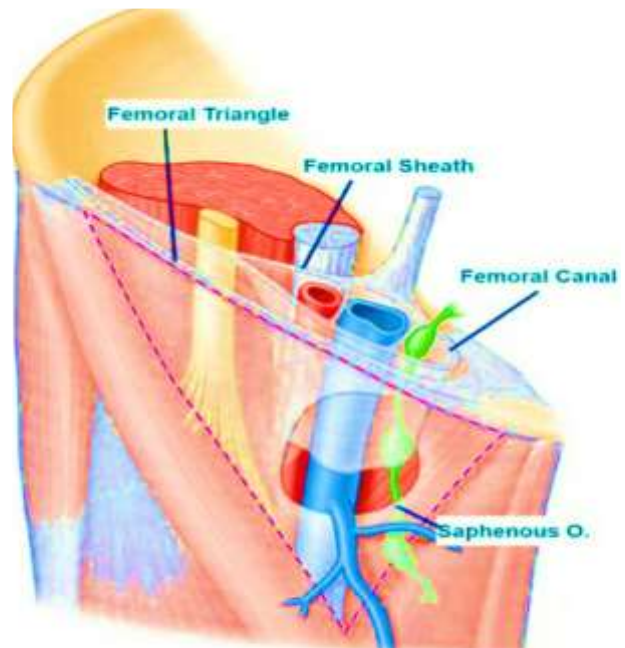
* Communications of the femoral triangle:

- (1) Superiorly: it communicates, deep to the inguinal lig., with iliac fossa of abdomen.
- (2) Inferiorly: it communicates, at the apex of the Δ , with the upper end of the subsartorial canal.

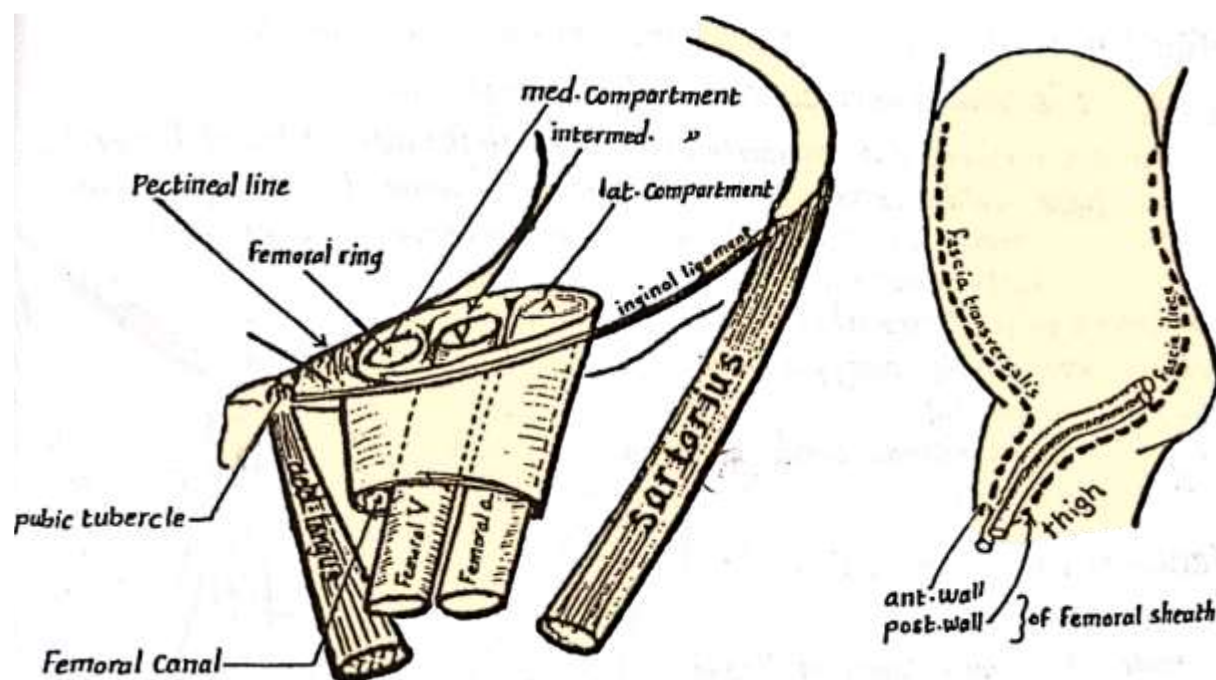


Contents of the femoral triangle

- (1) Femoral artery & its branches (see p. 76)
- (2) Femoral vein & its tributaries (see p. 88)
- (3) Femoral sheath: surrounding the upper 4 cm of femoral vessels & containing the femoral canal (p. 51)
- (4) Femoral nerve & its brs.: outside the femoral sheath (see p. 95)
- (5) Femoral br. of genitofemoral n.: in the lat. compartment of the femoral sheath (see p.93)
- (6) lat. Cut. n. of thigh : in the upper lat. angle of the Δ (see p. 93)
- (7) Deep group of inguinal lymph nodes:
(1-3 nodes along the med. side of femoral v.)
- (8) Collection of fat in which the previous structures are embedded.



Comment on the contents of femoral triangle



Femoral Sheath

* **Definition:** it is a fascial sheath surrounding the upper 4 cm of femoral vessels in the femoral triangle.

* **Shape & Size:** it is funnel-shaped having ant. & post. walls, base, apex, med. & lat. margins:

- the base: is directed upwards (continuous with the abdominal cavity behind the inguinal lig.)
- the apex: is directed downwards & blends with the adventitia of femoral vessels.
- the lat. margin: is oblique & about 4 cm long.
- the med. margin: is vertical & about 1 ½ cm long.

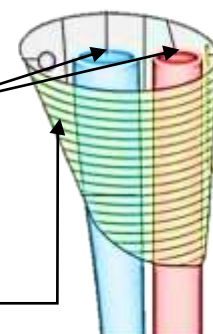
* Formation of the femoral sheath:

- the ant. wall: is a downward prolongation of fascia transversalis lining the ant. abd. wall.
- the post. wall: is a downward prolongation of fascia iliaca of the post. abd. wall.

* Compartment of the femoral sheath: 2 anteroposterior septa

divide the sheath into 3 compartment:

- (1) lat. compartment: containing femoral a. & femoral br. of genitofem. n.
- (2) Intermediate compartment: containing the femoral vein.
- (3) Medial compartment: called femoral canal: containing fat & one lymph node.



Femoral Canal

* **Definition:** it is the most med. compartment of the femoral sheath.

* **Shape:** it is conical vertical canal 1 ½ cm long having:

(1) apex: directed downwards (blending with the adventitia of femoral v.

(2) base: called **femoral ring**: it is directed upwards, opening into the cavity & is normally closed by a condensation of extraperitoneal fatty tissue called the femoral septum.

* **Boundaries of the femoral ring:**

- posteriorly: pectineal lig. (along pectineal line)

- anteriorly: inguinal lig.

- medially: the sharp crescentic border of lacunar lig.

- laterally: femoral vein.

* **Contents of the femoral canal:**

(1) condensation of fat.

(2) lymph node of femoral canal (of Cloquet).

(3) lymphatic vessels.

* **Functions of the femoral canal:**

(1) acts as a dead space alongside the femoral vein allowing its distension during increased venous return from the lower limb.

(2) it is the route for passage of lymphatic from the deep inguinal L. Ns to the abdominal L. Ns

N.B: femoral ring & femoral canal are wider in females than males (due to wider pelvis)

* **Applied anatomy: Femoral hernia:**

- Femoral canal represents a weak area of the abdominal wall. It may allow the passage of some of the abd. contents (e.g. loop of intestine) down through the femoral ring into the femoral canal. This is called **Femoral Hernia**.

* **Course of descent of femoral hernia:**

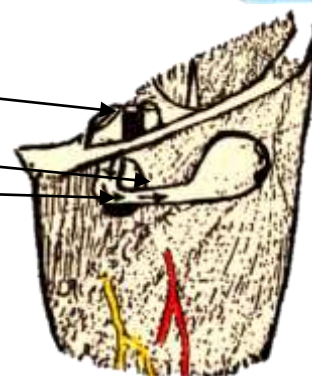
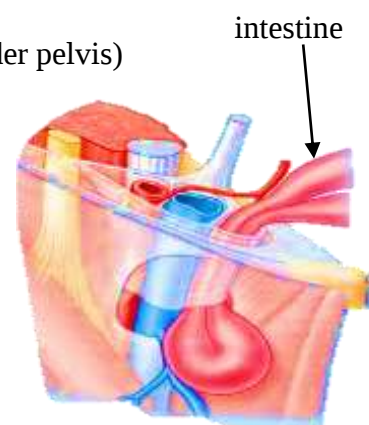
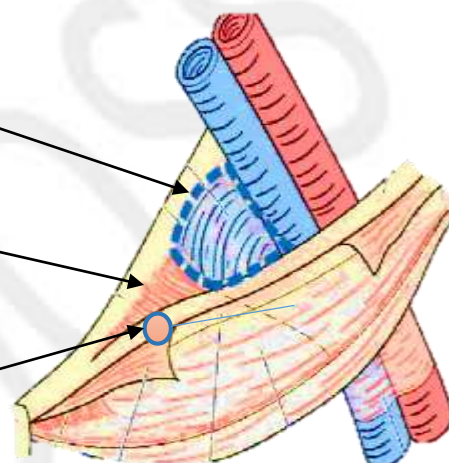
(1) it enters the femoral ring

(2) it passes downwards through the femoral canal

(3) it passes forward through the saphenous opening

(4) finally it passes upwards & laterally

N.B: femoral hernia is commoner in **females** due to wide femoral ring.



Adductor canal (Subsartorial canal, canal of Hunter)

* **Site:** it is an intermuscular passes situated on the med. aspect of the middle $\frac{1}{3}$ of the thigh undercover of sartorius m.

* **Beginning:** above, at the apex of the femoral triangle.

* **End:** below, at the opening in adductor magnus (adductor hiatus)
By becoming continuous with the popliteal fossa.

* **Shape:** it is triangle in cross-section.

* **Boundaries:**

(A) **Anteromedial wall (roof)** is formed of:

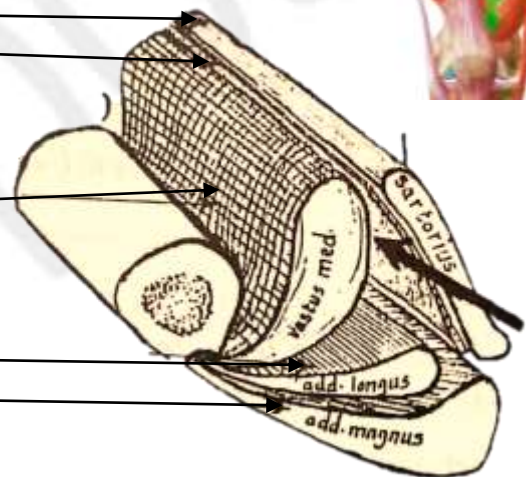
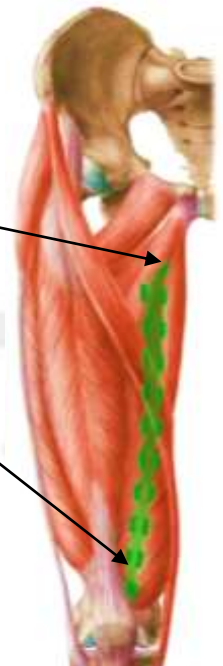
- (1) sartorius m.
- (2) strong sheet deep fascia (stretching between vastus medialis & add. magnus)

(B) **Anterolateral wall:**

formed by vastus medialis m.

(C) **Posterior wall (floor)** formed of:

- (1) add. longus m.: in the upper part.
- (2) add. magnus m.: in the lower part.



Contents of Subsartorial canal

(3 vessels & 3 nerves)

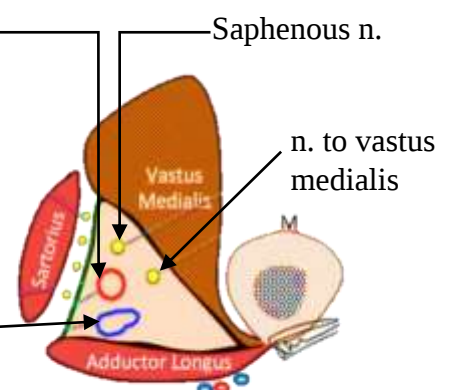
(1) **Femoral artery:**

- Enters the canal through its upper end.
- leaves the canal through its lower end.
- **Relations:**
 - (A) in the upper part: it lies ant.to the femoral v.
 - (B) in the lower part : it lies anteromedial to the femoral v.

(2) **Femoral vein:**

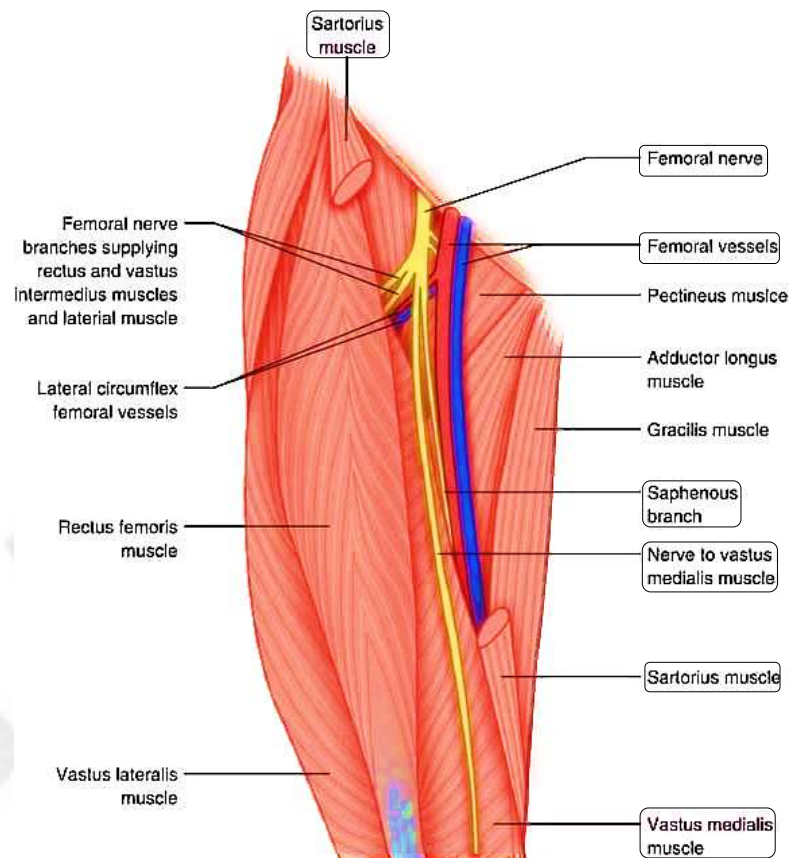
- enters the canal through its lower opening (add. hiatus)
- leaves the canal through its upper end (apex of femoral Δ)

- **Relations:** (1) in the lower part: it lies posterolat.to femoral a.
- (2) in the lower part: it lies posterior to femoral a.



(3) Descending genicular a.:

- arises as a branch of femoral a. in the lower part of the subsartorial canal.
- it leaves the canal by piercing the fibrous roof (not through its lower opening).
- it divides into:
 - (a) superficial saphenous br.: accompanies the saphenous n.
 - (b) deep muscular br.: enters vastus medialis & reaches the knee.



(4) N. to Vastus Medialis:

- it enters the canal through its upper end.
- it descends lat. to the femoral a.
- it ends by entering vastus medialis in the upper part of the canal.

(5) Saphenous nerve:

- it enters the canal through its upper end.
- it crosses superficial to the femoral a. from lat. to med.*
- it leaves the canal by piercing the fibrous roof above the lower end.

(6) subsartorial plexus of nerves:

it is small plexus of nerves formed inside the canal by branches from:

- (a) saphenous n.
- (b) med. cut. n. of thigh.
- (c) ant. division of obturator n.

N.B:

- 2 structures enter the upper end of the canal & leaves it through its lower end:
 - (a) femoral a.
 - (b) femoral v.
- 2 structures enter the upper end & **Do Not** leave through its lower end:
 - (a) saphenous n.
 - (b) n. to vastus medialis.
- 2 structure are formed within the canal:
 - (a) descending genicular a.
 - (b) subsartorial plexus of nerves.

Muscles of back of thigh (Hamstring muscles)

*General remarks:

(1) They are **called hamstring** muscles because their tendons from cords (strings) in the ham region (popliteal fossa & back of thigh).

(2) They **include 3 muscles:**

- (a) biceps femoris
- (b) semitendinosus
- (c) semimembranosus

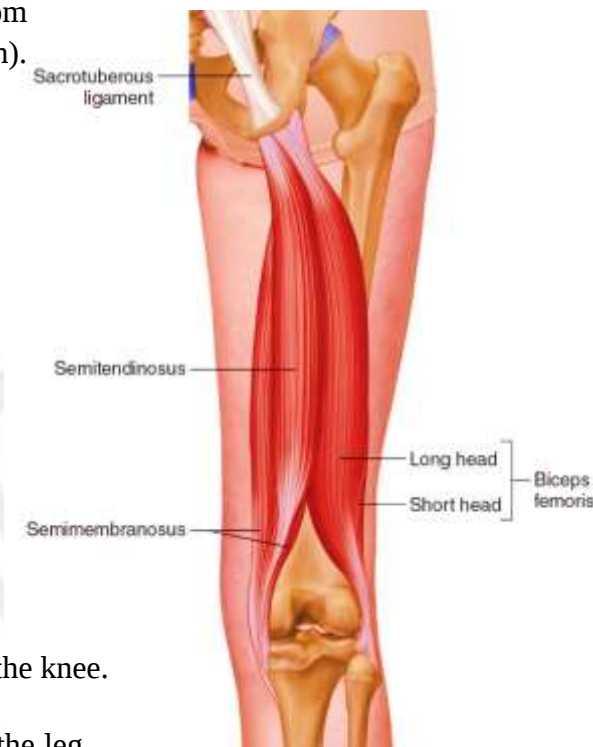
(3) **Insertion:** in the upper end of tibia & fibula.

(4) **N. Supply:** sciatic n.

(5) **Blood Supply:** mainly from perforating brs. of profunda a.

(6) Action:

- (a) all have a common action of extending the hip & flexing the knee.
- (b) the muscles inserted in the med. bone (tibia) which are semitendinosus & semimembranosus produce med. rotation of the leg.
- (c) the muscle inserted in the lat. bone (fibula) produce lat. rotation of leg.



(1) Biceps femoris

*It is lat. hamstring m.

***Origin:** by 2 heads:

- (1) long head: from lower med. area of upper part of ischial tuberosity (in common with semitendinosus muscle).
- (2) short head: from linea aspera + upper 1/2 of lat. supracondylar ridge.



***Insertion:** head of fibula in front of the styloid process

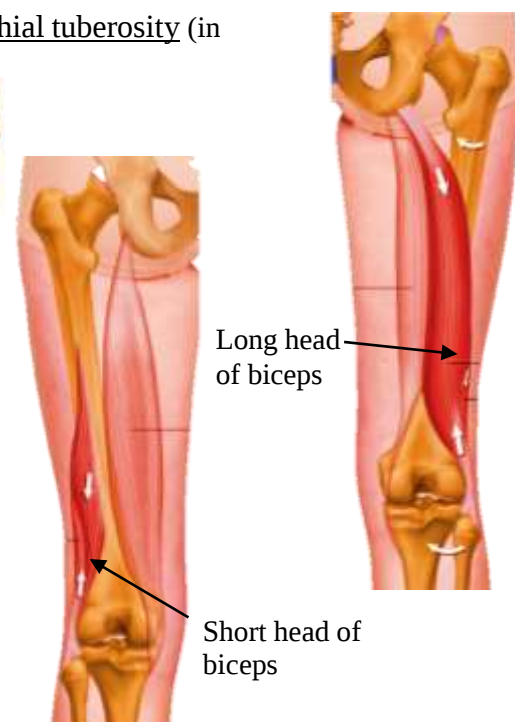
N. B: the tendon of insertion of biceps is splitted by or folded around the fibular collateral lig.

***N. Supply:** Sciatic n.: each head has a separate br.:

N. B: (1) the long head is supplied by the **tibial part**
(2) the short head is supplied by the **common peroneal** part of the sciatic n.

* **Action:** (1) long head: weak extensor of the hip joint.
(2) short head: flexes the knee & rotates the leg laterally.

***Imp. relations:** (1) the long head over lies the sciatic n.
(2) the tendon of insertion is related medially to com. peroneal n.



(2) Semitendinosus m.

* It is a slender m. having a long tendon replacing its lower $\frac{1}{3}$ (hence the name semitendinosus).

***Origin:** from the lower med. area of upper part of ischial tuberosity. (in common with the long head of biceps).

***Insertion:** upper part of med. surface of tibia (behind the insertion of gracilis)

***N. supply:** sciatic n. (by 2 brs. From its tibial part).

***Action:** (1) extension of hip joint.

(2) flexion of knee & med. rotation of the leg.

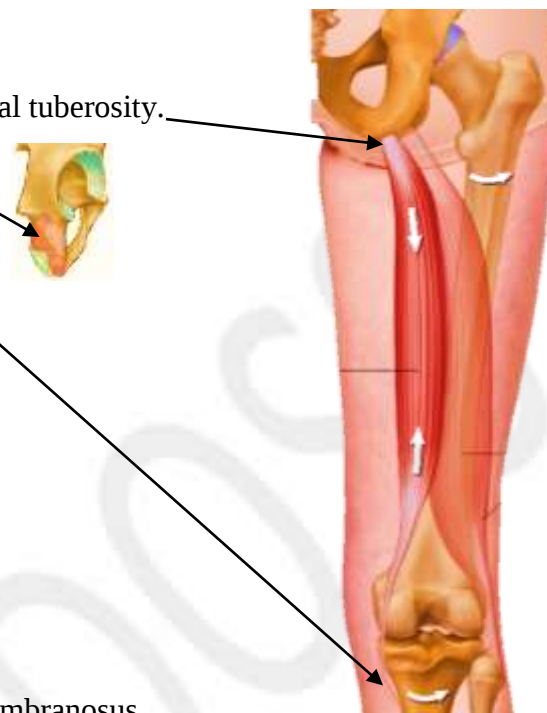
(3) it is one of the Guy ropes (S.G.S) which steady the pelvis on the femur.

***Imp. relations:**

(1) it lies in a groove on the post. surface of semimembranosus.

(2) its lower $\frac{1}{3}$ shares in the formation of med. boundary of popl. fossa.

(3) a deep brusa separates its tendon from the med. lig. of knee joint.



(3) Semimembranosus m.

*It is the thickest m. of the hamstring group.

*it derives its name from the fact that its upper part is membrane-like.

***Origin:** from the upper lat. area of upper part of ischial tuberosity.

***Insertion:**

(1) by a flat tendon into the groove on the back of med. condyle of tibia

(2) by 3 expansions (extensions) from the tendon of insertion:

(a) extension passing **downwards covering the popliteus m. then becomes attached** to the soleal line.

(b) extension passing **upwards & laterally** across the capsule of the knee forming the post. oblique popliteal ligament.

(c) extension passing **forwards to the med. side of med. condyle of tibia.**

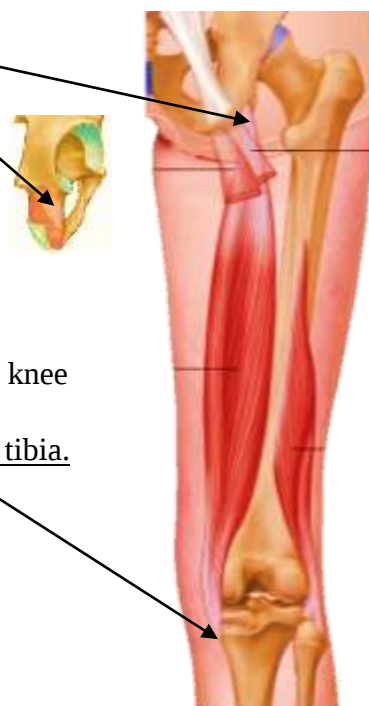
***N. Supply:** sciatic n. (from its tibial part).

***Action:**

(1) extension of the hip.

(2) flexion of the knee & med. rotation of the leg.

***Imp. relations:** (1) its upper membrane-like tendon is sharp medially & rounded laterally
(2) its lower $\frac{1}{3}$ shares in formation of the med. boundary of popl. fossa
(3) a bursa lies between its lower end & the med. head of gastrocnemius m.



Popliteal Fossa

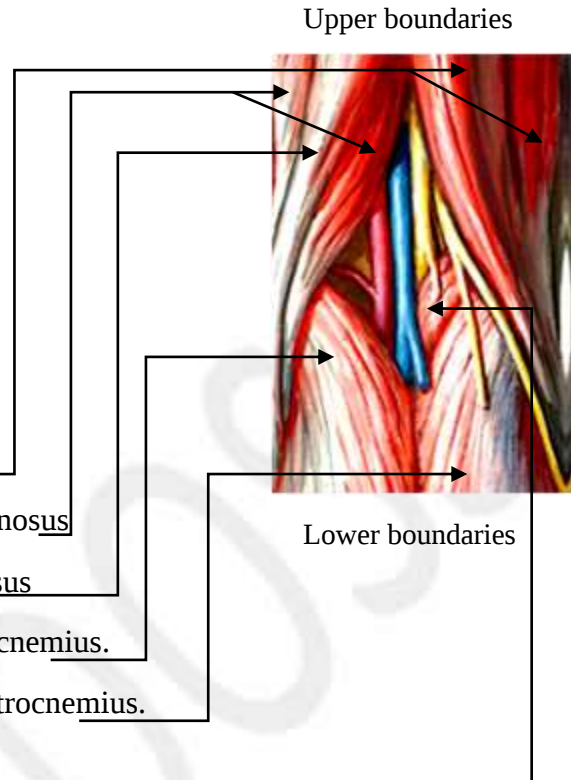
* **Site:** it is an intermuscular space lying on the back of:

- (a) lower $\frac{1}{3}$ of thigh.
- (b) knee joint.
- (c) upper part of leg.

* **Shape:** diamond-shaped having 4 borders & 4 angles.

* **Boundaries:**

- (1) upper lat. border: formed by biceps m.
- (2) upper med. border: formed by semimembranosus
semitendinosus
- (3) lower med. border: formed by med. head of gastrocnemius.
- (4) lower lat. border: formed by lat. head of gastrocnemius.
Plantaris m.



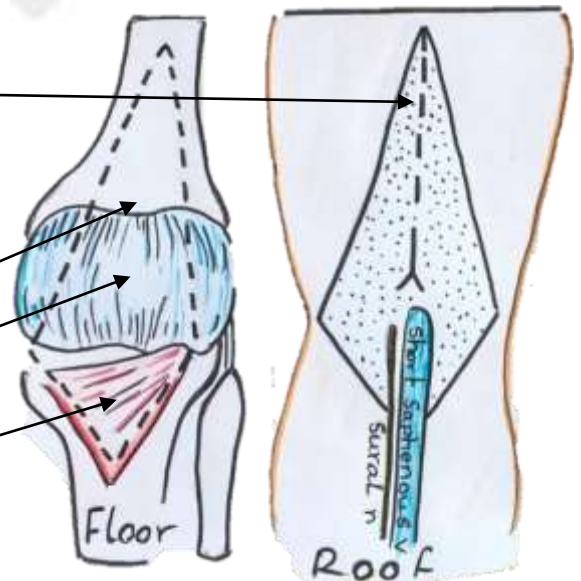
* **Roof:** formed of skin, superficial fascia & deep fascia.

- (1) the superficial fascia contains:
 - (a) lower part of post. cutaneous n. of the thigh.
 - (b) upper part of short saphenous vein.

(2) the deep fascia (popliteal fascia) is pierced by the short saphenous v.

* **Floor:** is formed from above downwards by:

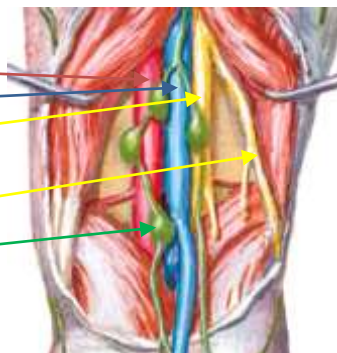
- (1) the popliteal surface of femur.
- (2) back of capsule of knee joint.
- (3) popliteus m. & its covering fascia.



N.B: the popliteal fossa is limited below by the lower border of popliteus m. (the soleal line).

* **Contents of the popliteal fossa:**

- (1) Popliteal artery & its branches.
- (2) Popliteal vein & its tributaries.
- (3) Tibia nerve & its branches.
- (4) Common peroneal nerve & its branches.
- (5) Popliteal lymph nodes.
- (6) Variable amount of fat.



Comment on the contents of popl.fossa

(1) Tibia nerve (mid. popliteal n):

- enters the popliteal fossa through its upper angle.
- descends vertically downward crossing popliteal superficially from lateral to medial.
- leaves the fossa at its lower angle (becoming the post. tibial n).
- gives muscular & articular branch. In addition to the sural n. which descend in the roof of the popliteal fossa (see p. 101)

(2) Common peroneal (lat. popliteal) nerve:

- enter the fossa through its upper angle.
- descend downward & laterally along the med. side of the biceps m.
- leaves the fossa through its later angle (see p. 104)

(3) Popliteal artery:

- it is the deepest (most ant.) Structure in the fossa.
- it enters the fossa through the adductor hiatus as a continuation of the femoral a.
- descends on:
 - (a) popliteal surface of femur
 - (b) Back of capsule of knee joint
 - (c) Fascia covering the popliteal m.
- ends: at the lower border of popliteus by dividing into ant. & post. tibial arteries.
- branches: in the fossa: (a) muscular (b) 5 genicular (see p. 82)

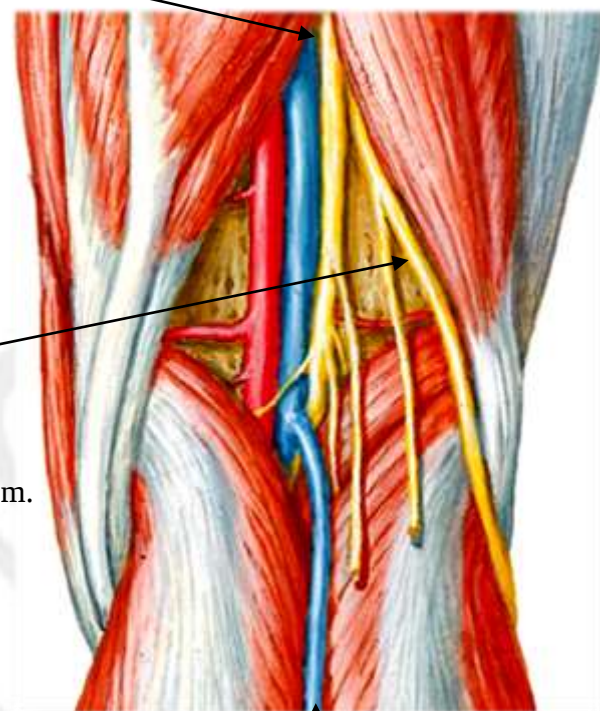
(4) Popliteal vein:

- Begins (& enters the fossa) at the lower border of popliteus by the union of venae comitantes of ant. & post. tibial arteries.
- it ascends upward crossing the popliteal a. from medial (below) to the lateral (above).*
- along its course it lie between tibial n. (superficially) & popliteal a. (deeply).*
- ends: by passing through the add. hiatus to become the femoral vein.
- tributaries: (a) short saphenous v. (b) muscular veins (c) 5 genicular veins.

(5) Popliteal lymph nodes:

- lie deep to the deep fascia, near the termination of the short saphenous V.
- receive afferent lymphatics from deep parts of the leg & drain into deep inguinal L.N.

(6) Popliteal fat: fills the spaces between the contents of the popliteal fossa.

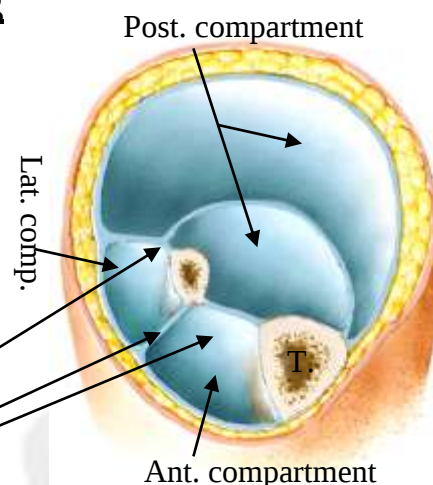


Compartment of the leg

* Deep fascia of the leg or fascia cruris

(cruris=leg):

- It is a strong tight membrane that surrounds the leg except the med. (subcutaneous) surface of tibia
- It forms 2 intermuscular septa:
 - (1) Post. intremuscular septum: attached to the post. border of fibula
 - (2) Ant. Intremuscular septum: attached to the ant. border of fibula
- These 2 septa, together with the interosseous membrane, divide the leg into 3 compartments; ant, post & lat.:



Ant. (extensor) compartment	Post. (flexor) compartment	Lat. (peroneal) compartment
- <u>lies</u> in front of the interosseous memb., <u>bounded</u> medially by the tibial & laterally by the ant. septum.	- <u>lies</u> behind the interosseous memb., <u>bounded</u> medially by the tibial & laterally by the post. septum.	- <u>lies</u> lat. to the fibula & is <u>bounded</u> anteriorly by the ant. septum & posteriorly by the post. septum.
-it <u>contains</u> extensor muscles whose tendons pass in front of the ankle joint.	-it <u>contains</u> flexor muscles, divided by the transverse septum into superficial & deep group whose tendons pass behind the ankle joint.	-it <u>contains</u> evtor muscles whose tendons pass behind The lat. malleolus.
-it is <u>supplied</u> by ant. tibial vessels & nerve. (deep. peroneal n.)	- <u>supplied</u> by post. tibia n. & vessels.	- <u>supplied</u> by superficial peroneal n. - (no vessels pass in the lat. comp.).

Anterior compartment of the leg & foot

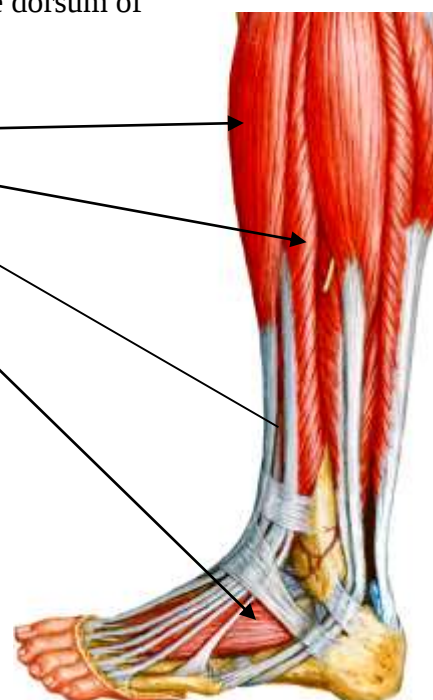
General remarks:

* They include 5 muscles (4 of the ant. comp. of the leg & 1 on the dorsum of the foot):

- * Origin:
- ▶ (1) Tibialis ant. (arise from tibia)
 - ▶ (2) Ext. digitorum longus (arise from fibula)
 - ▶ (3) Ext. hallucis longus (arise from fibula)
 - ▶ (4) Peroneus tertius (from fibula)
 - ▶ (5) Ext. digitorum brevis (from calcaneus)

- * Insertion:
- 1st muscle: in the base of the 1st metatarsal bone.
 - 5th muscle: in the base of the 5th metatarsal bone.
 - the remaining muscles pass to the toes as indicated by their names.

* N. supply: all are supplied by the ant. tibial nerve.



***Action:** -all are dorsiflexors of the ankle (except ext. dig. brevis).

-each muscle has a special action (indicated by its name).

(1) Tibialis anterior m

***Origin:** -upper $\frac{2}{3}$ of lat. surface of the shaft of tibia.
-adjoining part of the interosseous membrane.
-intermuscular septum between it & ext. digit. longus.

***Insertion:** -the muscles ends in a tendon which passes deep to the sup. & inf. extensor retinacula to be inserted into:
(1) med. side of the med. cuniform.
(2) adjoining part of base of the 1st metatarsal bone.

***Nerve:** ant. tibial n.

***Action:** (1) dorsiflexion of ankle (when the foot is off the ground).
(2) inversion of the foot (when the foot is on the ground).
(3) helps to maintain the med. longitudinal arch of the foot.



(2) Extensor hallucis longus

***Origin:** -middle $\frac{2}{4}$ of the ant. surface of fibula.
- adjoining part of the interosseous membrane.

***Insertion:** base of terminal phalanx of the big toe.

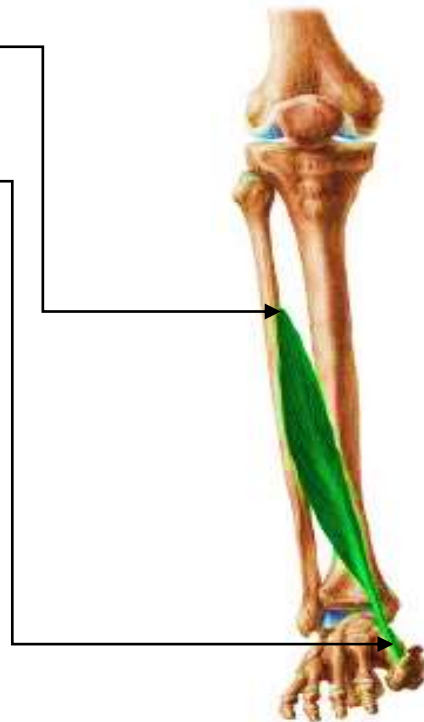
***N. supply:** ant. tibial n.

*** Action:**

- (1) extension of all joint of the big toe.
- (2) dorsiflexion of the ankle joint.

***Imp. relations:**

- (1) at its origin, the muscle lies deep under cover of
 - tibialis ant.
 - ext. digit. Longus
- (2) in the lower part, its tendon emerges between the previous 2 muscles & descend behind the sup. & inf. extensor retinacula.



(3) Extensor digitorum longus

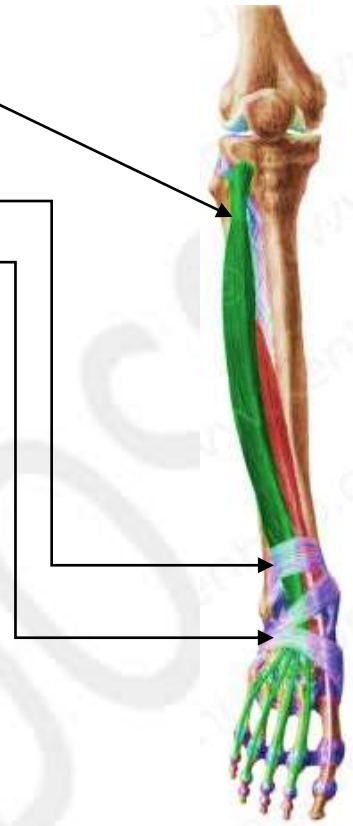
- * **Origin:** (1) upper $\frac{3}{4}$ of the ant. surface of fibula.
 (2) adjoining part of the interosseous membrane.

- * **Course:** its tendon passes deep to the sup ext. retinaculum than divides under cover of the inf. ext. retinaculum into 4 tendons passing to the lat. 4 toes.
 - each tendon is joined in its lat. side by tendon of ext. digit. brevis forming dorsal digital expansion.

- * **Insertion:** each expansion dividing into 3 slips:
 - middle: inserted into base of middle phalanx
 - 2 collaterals: inserted into base of terminal phalanx

- * **N. supply:** ant. tibial n.

- * **Action:** (1) extension of joint of lat. 4 toes (2) dorsiflexion of ankle joint.



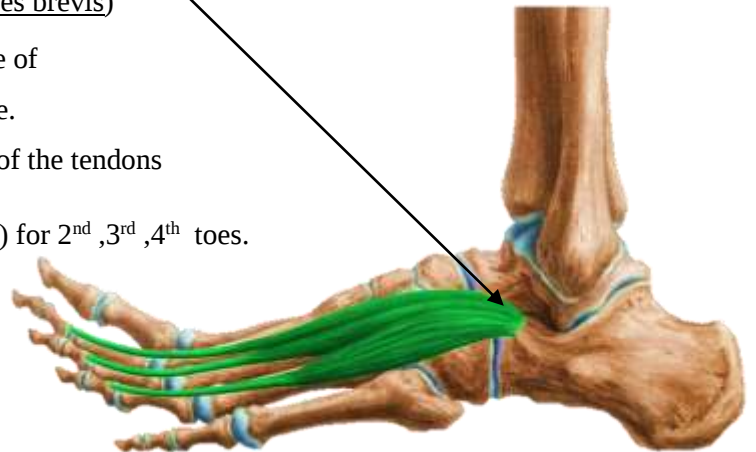
(4) Extensor digitorum brevis

- * **Origin:** ant. part of the upper (dorsal) surface of calcaneus.

- * **Insertion:** -the muscle breaks into 4 slips for the med. 4 toes
 (the most med. slip is called extensor hallucis brevis)
 - the ext. hallucis brevis is inserted into base of proximal phalanx of the big toe.
 - the remaining 3 tendons join the lat. side of the tendons ext. digit. longus (dorsal digital expansions) for 2nd, 3rd, 4th toes.

- * **N. supply:** ant. tibial n. (by its lat. terminal br.)

- * **Action:** (1) Ext. hall. brevis: extends proximal phalanx of the big toe.
 (2) the other 3 tendons: extend middle & terminal phalanges of 2-4 toes (particularly in dorsiflexed foot).



(5) peroneus tertius m. (may be absent)

It may be regarded as part of ext. digit. longus (forming its 5th tendon)

*** Origin:**

- (1) lower $\frac{1}{4}$ of ant. surface of fibula.
- (2) adjoining part of the interosseous membrane.
- (3) ant. intermuscular septum.

*** Insertion:** (1) dorsal aspect of base of the 5th metatarsal bone.
 (2) by triangular expansion into med. side of shaft of 5th metatarsal bone.

*** N. supply:** ant. tibial n.

*** Action:** (1) dorsiflexion of ankle joint (2) eversion of foot.



Lat. Compartment of the leg (peroneal muscles)

*** General remarks:**

- It contains 2 muscles
- (1) peroneus longus (having longer tendon)
 - (2) peroneus brevis (having shorter tendon)

N.B:

- (a) peroneus means related to **fibula (perone bone)**.
- (b) peroneus **tertius** (of ant. comp.) **means the 3rd peroneal muscle**.

*** Origin:** from the lat. surface of the fibula.

Their tendon pass behind the lat. malleolus (i.e. behind ankle joint) & are held in position by the sup. & inf. peroneal retinacula.

*** N. supply:** superficial peroneal (musculocutaneous) n.

*** Action:** planter flexion & eversion of foot.



1- Peroneus longus m.

(The superficial of the 2 lat. peroneal muscles)

* **Origin:** (1) head and upper $\frac{2}{3}$ of lat. surface of fibula.

Ant. & post. intermuscular septa of the leg.

(2) deep fascia of the leg.

* **Course:** the muscle ends in a long tendon which passes:

(1) behind the lat. malleolus where it is held in place by the superior peroneal retinaculum.

(2) then it runs across the lat. surface of calcaneus where it is held in place by the inf. peroneal retinaculum.

(3) it crosses the lat. side of the cuboid bone then the groove on its under surface.

(4) it crosses the sole (in the 4th layer) from lat. to med. & is kept in place by the long plantar lig. & it contains sesamoid bone as it passes below the cuboid bone.

* **Insertion:** (1) Lat. side of base of 1st metatarsal bone

(2) lat. side of the medial cuneiform bone

* **N. supply:** Musculocutaneous (superficial peroneal) n.

* **Action:** (1) plantar flexion of ankle joint

(2) eversion of the foot (when the foot is off the ground).

(3) maintains the lat. longitudinal and transverse arches of foot.



2- Peroneus Brevis m.

* **Origin:** (1) lower $\frac{2}{3}$ of lat. surface of shaft of fibula

(2) ant. and post. intermuscular septa of the leg.

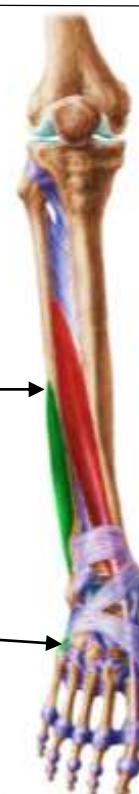
(3) deep fascia of the leg.

* **Course:**

the muscle ends in a tendon which passes behind the lateral malleolus then on the lat. surface of calcaneus being held in position by the sup. & inf. peroneal retinaculae.

* **Insertion:** tuberosity of the 5th metatarsal bone.

* **N. Supply:** Musculocutaneous (superficial peroneal) n.



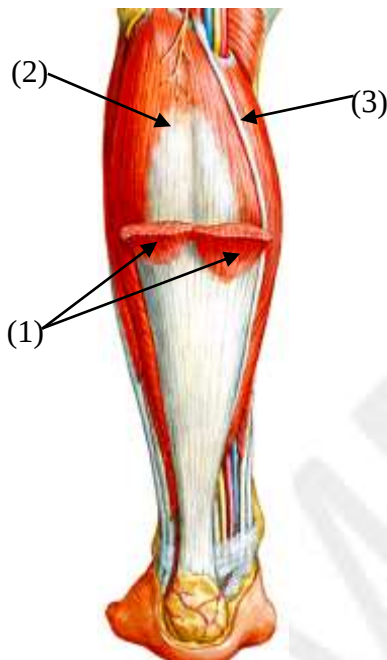
* **Action:** (1) eversion of the foot (when it is off the ground).

(2) plantar flexion of ankle.

N.B: eversion and inversion do not occur in the ankle joint but take place in the subtalar and talocalcaneo-navicular joints.

Muscles of the back of the leg

Superficial group

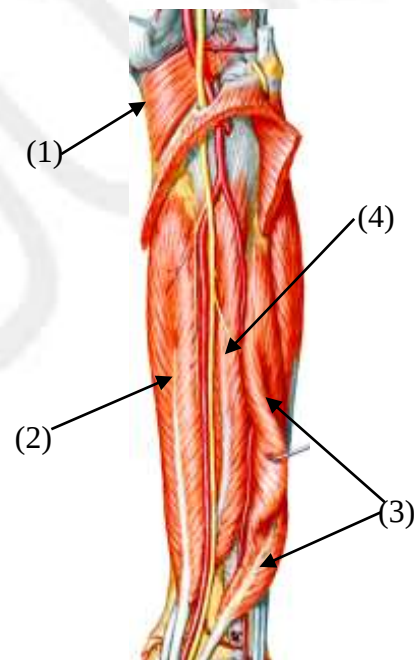


*They include the following 3 muscles:

- (1) Gastrocnemius (= twin bellies) m.
- (2) Soleus m. (shaped like sole of a boot).
- (3) plantaris m. (inbetween the previous 2).

* All of them are inserted into calcaneus by the tendocalcaneus (the thickest and strongest tendon in the body).

Deep group



*They include the following 4 muscles:

- (1) popliteus.
- (2) flexor digitorum longus.
- (3) flexor hallucis longus.
- (4) tibialis post.

(1) Gastrocnemius m.

It is a strong m. which arises by 2 heads and crosses 2 joints (knee and ankle)

* **Origin:** by 2 heads:

(1) lat. head: arises from a rough impression on the lat. surface of lat. condyle of femur above lat. epicondyle.

(2) med. head: popliteal surface of femur above med. condyle.

N.B: (a) the med. head is larger and fleshier than the lateral.

(b) the lat. head usually contains a sesamoid bone called fabella opposite the lat. condyle of femur.

(c) the med. head is separated from the capsule of knee J. by bursa.*

* **Course:** the 2 heads are separated in the upper ½ of leg by a furrow which contains 2 structures: Short. saphenous v. and Sural n.
- the 2 heads unite near the middle of leg forming tendocalcaneus.

* **Insertion:** by tendocalcaneus into the middle ⅓ of post. surface of calcaneus.

N.B: tendocalcaneus (Achilis) is the thickest and strongest

tendon in the body and is about 15 cm long.

- its ant. surface receives fleshy fibers of soleus m. almost down to the lower end.

- a bursa separates the tendon from upper part of post. surface of calcaneus.

* **N. supply:** med. popliteal (tibial) n.: each head receives separate br.

* **Action:** (1) a powerful plantar flexor of ankle.

(2) helps flexion of the knee (with hamstrings)

(3) antigravity m. acting with soleus (see p. 66)



(2) Plantaris

* it's a rudimentary muscle in man and may be absent (as palmaris longus)

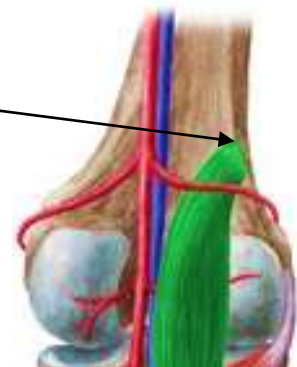
* it has a short belly and a long thin tendon.

* **Origin:** (1) lower part of lat. supracondylar ridge of femur.
(2) from the oblique popliteal lig.

* **Course:** the muscle belly lies just med. to lat. head of gastrocnemius:

- the muscle develops a very long tendon which lies

between gastrocnemius and soleus, crossing from lat. to m.



- * **Insertion** : either in the tendocalcaneus, or separately into post. surface of calcaneus
- * **N. supply** : tibial (med. popliteal) n
- * **Action** : it is s rudimentary m. (accessory to Gastrocnemius).

(3) SOLEUS MUSCLE

It is sole-shaped multipennate muscle lying deep to gastrocnemius.

* **Origin** : horse - shoe shaped origin from:

- (1) upper $\frac{1}{3}$ of post. surface of **fibula** + back of its head .
- (2) strong **fibrous arch** between tibia and fibula which overlies tibial n. and popliteal a
- (3) **Soleal line** and middle $\frac{1}{3}$ of m. border of tibia

* **Insertion**: into the deep surface of the tendocalcaneus which is inserted into the middle $\frac{1}{3}$ of post. surface of calcaneus

* **N. supply** :

- (1) med. popliteal (tibial) nerve : by branch to its superficial surface.
- (2) post. tibial n. (in the middle of the leg) by br. to its deep surface .

* **Action**

(1) It is a powerful flexor of the foot

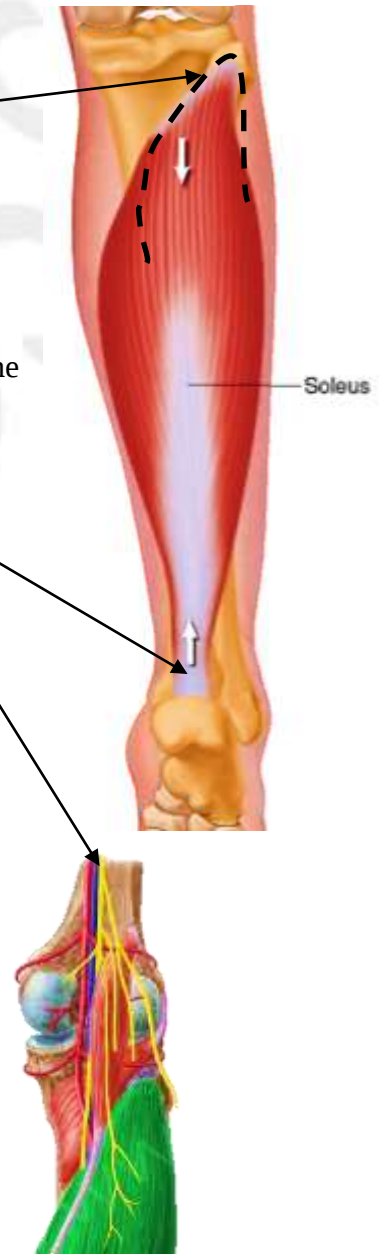
It has a very strong but slow action (like the 1st gear of the car) When movement is under way, the quicker acting gastrocnemius increases the speed (like the top gear .of the car) e.g. in running

(2) it is a strong antigravity muscle

It counteracts the tendency of body weight to fall in front of .ankle by pulling the leg backwards , thus maintains the standing position

N.B :

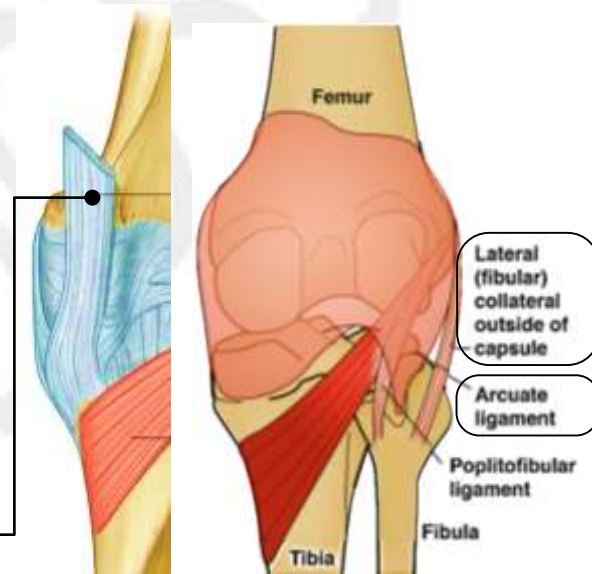
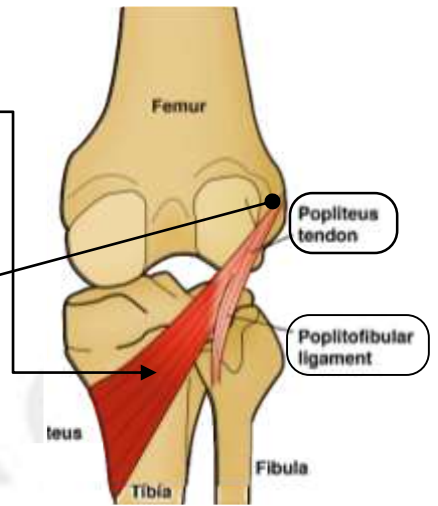
- (1) the 2 heads of gastrocnemius + the soleus are called the **Triceps surae** muscle (as they form muscular mass having 3 heads) .
- (2) Soleus is called **Peripheral Venous heart** because it contains a rich venous plexus which drains blood from the superficial veins (tributaries of saphenous veins) & pumps it to the deep veins.



(4) Popliteus muscle

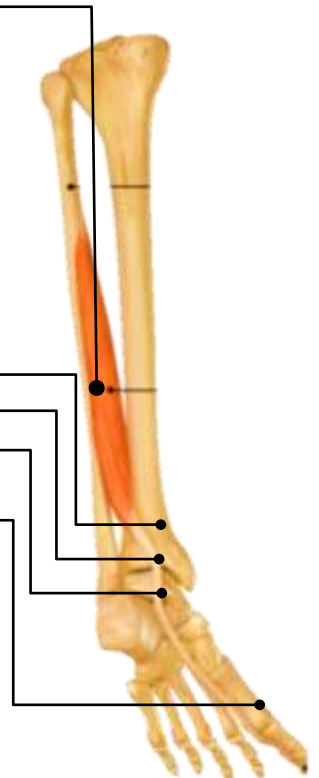
- * It is a flat triangular m. forming the lower part of the floor of the popliteal fossa.
- * **Origin:** by a strong rounded tendon from the ant-part of the groove on the lat. surface of lat. condyle of femur (popliteal sulcus) lying below the lat. epicondyle (intracapsular extrasynovial).
- * **Course:** the tendon emerges through a perforation on the back of the capsule below the arcuate popliteal ligament.
- * **Insertion:** fleshy into the med. $\frac{2}{3}$ of the triangular area above the soleal line on the post-surface of tibia.
- * **N. Supply:** tibial N. while in the popliteal fossa (by a br. which hooks around the lower border of popliteus to reach its (ant. surface).
- * **Action:** (1) weak Flexor of the knee joint.
 (2) **Unlocking** of knee joint: by rotating the femur laterally (when the Tibia is fixed) or rotating the tibia medially (when it is moveable), during the initial stage of flexion of the knee.
 (3) it refracts the lat. meniscus, protecting it from crushed between the Condyles of femur & tibia (see knee joint).

N.B: the muscle is covered by a thick popliteal fascia (extension from tendon of semimembranosus)



(5) Flexor Hallucis Longus

- * **Origin:** (1) lower $\frac{2}{3}$ of post-surface of fibula (below the origin of soleus m.)
 (2) lower part of post-surface of interosseous memb. & post. intermuscular septum.
- * **Insertion:** base of terminal phalanx of big toe
- * **N. Supply:** post.tibial n.
- * **Course:** its tendon has a special course(using 3 bony areas as pulleys):
 (1) it lies in a shallow groove on the back of the lower end of tibia
 (2) then lies in deep groove on the back of talus (between 2 tubercles)
 (3) then lies in a groove on undersurface of the sustentaculum tali
 (4) it runs in the 2nd layer of the Sole, crossed by tendon of fl. digit. longus.
 (5) Finally it passes between 2 sesamoid bones below the head of 1st metatarsal bone.
- * **Action:** (1) flexion of all Joints of the big toe
 (2) assists in planter flexion of the foot.
 (3) supports the med. longitudinal arch of the foot.



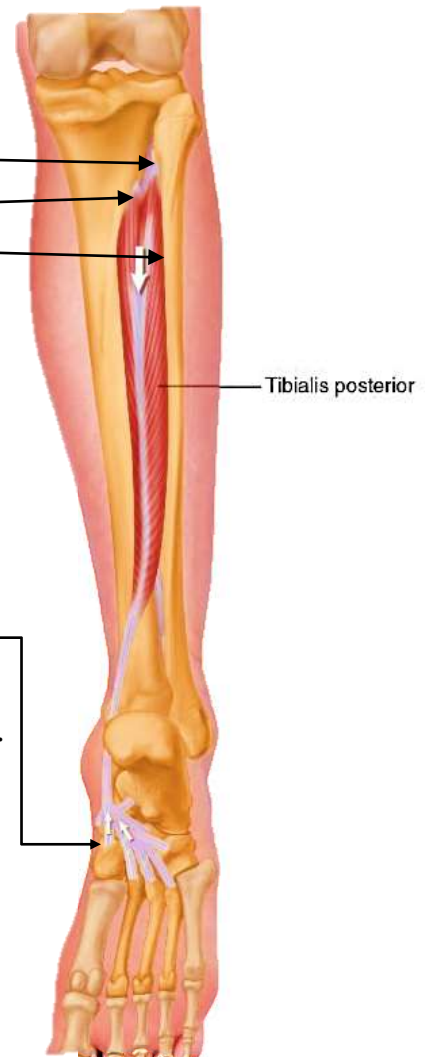
(6) Flexor Digitorum longus

- * **Origin:** upper $\frac{2}{3}$ of med. part of post. surface of tibia
(below the soleal line & medial to the vertical line)
- * **Course:** (1) its tendon crosses that of tibialis post. then passes behind med. malleolus.
(2) it runs along the Free margin of the sustentaculum tali
(3) then it runs forwards in the 2nd layer of the sole where it crosses superficial to (below) the tendon of flex. hall. longus (from med. to lat.)
(4) near the toes, it divides into 4 smaller tendons which perforate the tendons of flexor digitorum brevis.
- * **Insertion:**
bases of terminal phalanges of the lat. 4 toes.
- * **N. Supply:** post. tibial n.
- * **Action:**
(1) flexion of all Joints of the lat. 4 toes
(2) planter flexion of foot.



(7) Tibialis Posterior M.

- * It is a fusiform bipennate m. that lies the deepest in the post compartment.
- * **Origin:** (1) post. surface of the interosseous membrane
(2) upper $\frac{2}{3}$ of post. surface of tibia lateral to the vertical line
(3) upper $\frac{2}{3}$ of post. surface of fibula (in front of the med. crest).
(4) intermuscular septa of the back of leg.
- * **Course:**
(1) its tendon is crossed superficially by that of fl. digit. longus in the lower $\frac{1}{4}$ of leg.
(2) its tendon lies in a groove on the back of the med. malleolus.
(3) its tendon enters the foot deep b the flexor retinaculum (above sustentaculum).
- * **Insertion:** its tendon divides into 2 parts :
(a) med. part (main insertion): inserted into the tuberosity of navicular bone.
(b) lat. part inserted into: (1) all tarsal bones except the talus
(2) bases of 2nd, 3rd, 4th, metatarsal bones.
- * **N. Supply:** post. tibial n.
- * **Action:**
(1) inversion of the foot (with tibialis anterior).
(2) plantar flexion of foot
(3) maintains the med. longitudinal arch of the foot



Retinaculæ of the ankle

* They are thickened bands of deep fascia which surround the ankle joint & retain the tendons passing to the foot in position .
They include

- **2 extensor** retinacula {
 - sup. ext. retinaculum
 - inf. ext. retinaculum
- **2 peroneal** retinacula {
 - sup. peroneal. retinaculum
 - inf. peroneal. retinaculum
- **one flexor** retinaculum



1- Sup. ext. retinaculum

- * **Shape**: thick transverse band of deep fascia 1 inch broad
- * **Site**: lower part of leg, immediately above ankle joint
- * **Attachment**:
 - (1) medially : to the lower one inch of ant. border of tibia.
 - (2) laterally : to the lower one inch of ant. border of fibula.

* **Relations**:

Structures passing deep to it (arranged from med. to lat)	Structures passing superficial to it (arranged from med. to lat.)
(1) T om : Tibialis anterior (2) H as : Ext. H allucis longus (3) V ery: ant. tibial V essels (4) N ice: ant. tibial N erve (5) D og : ext. D igitorum longus (6) P ig : P eroneus tertius	(1) beginning of the great saphenous vein (2) lower part of saphenous n (3) branches of musculocutaneous n

2- Inferior extensor retinaculum

- * **Shape**: Y-shaped band of deep fascia having a stem & 2 limbs: sup. & inf.
- * **Site**: in front of ankle, below the sup. ext. retinaculum (more important than it) .
- * **Attachment**
 - a) the stem of the Y : is attached to the ant. part of the upper surface of calcaneus).
 - b) the upper band of the Y : attached to the ant. margin of the med. malleolus).
 - c) the lower band of the Y: attached to the deep fascia of the med. side of the foot).

* **Structures passing superficial to it**: as in sup. extensor retinaculum .

* **Structures passing deep to it**: as in sup. extensor retinaculum (except that the vessels are dorsalis pedis instead of ant. tibial).

* Synovial sheaths of extensor tendons:

(1) Synovial sheath for tibialis anterior tendons:

extends from the upper margin of the sup. extensor retinaculum to the interval between the 2 diverging limbs of the inf. ext. retinaculum

(2) Common sheath for ext. digitorum & peroneus tertius tendons :

starts just above the level of the 2 malleoli down to the level of the base of 5th metatarsal bone

(3) Synovial sheath for extensor hallucis longus tendon:

starts below that of ext. digitorum & extends to the base of 1st metatarsal bone



3- Superior peroneal retinaculum

* **Site:** lies over peroneus longus & berris tendons as they pass behind the lat. Malleolus

* Attachment

- above : to the back of the lat. malleolus
- below : to the lat. surface of calcaneus



4- Inferior peroneal retinaculum

* **Site:** it bridges over the 2 peroneal tendons (longus & berris) as they reach the lat. surface of calcaneus

* **Attachment:** it is attached by its 2 ends to the lat. surface of the calcaneus where it is continuous above with the stem of the inf. extensor retinaculum

* **synovial sheath of the 2 peroneal tendons:** begins as a single sheath proximally but becomes double distally, til 4 cm below tip of the lat. Malleolus

5- Flexor Retinaculum

* **Site :** below & behind the med. malleolus

* **Attachment :** above : to the post. border of med. malleolus
below : to the med. tubercle of calcaneus

* Structures passing deep to it (form med. to lat) :

- (1) Tom : Tibialis post. (its synovial sheath starts 4 cm above med. med. mall. & ends just proximal to navicular bone)
- (2) Does: flexor Digitorum longus (its synovial sheath stearts just above med. mall. & extends to the navicular bone)
- (3) Very : post. tibial Vessels (divides into med. & lat. plantar vessels)
- (4) Nice: post. tibial Nerve (divides into med. & lat. plantar nerves)
- (5) Hats : flexor Hallucis longus (its synovial sheath extends from the med. mall. To the base of the 1st metatarsal bone) .



The Foot

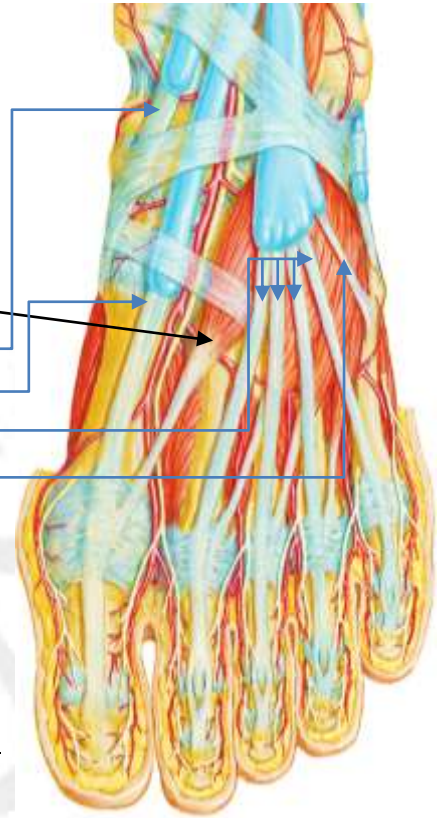
* Functions:

- (1) provides a rigid support for the body weight in standing
- (2) acts as a movable spring-like structure in walking

Dorsum of the foot

* Contains

- (A) One muscle (which has no homologue in the hand): ext. digit. berris
- (B) tendons of the extensor compartment of the leg :
 - tibialis ant.
 - ext. H. longus
 - ext. digit. longus
 - peroneus tertus
- (C) vessels
 - dorsalis pedis a. (p. 88)
 - dorsal venous arch (p. 92)
- (D) Nerves: terminations of
 - (1) deep peroneal (2) superficial peroneal, (3) saphenous (4) sural



Sole of the foot

plantar aponeurosis

- * It is the deep fascia of the sole
- * It is formed of central thick part & med. & lat. thin part.

(A) The central part covers fl. digit. brevis m. & has the following characters

- **Shape**: triangular in shape having an apex directed posteriorly towards the heel & base directed anteriorly towards the heads of the metatarsal bones

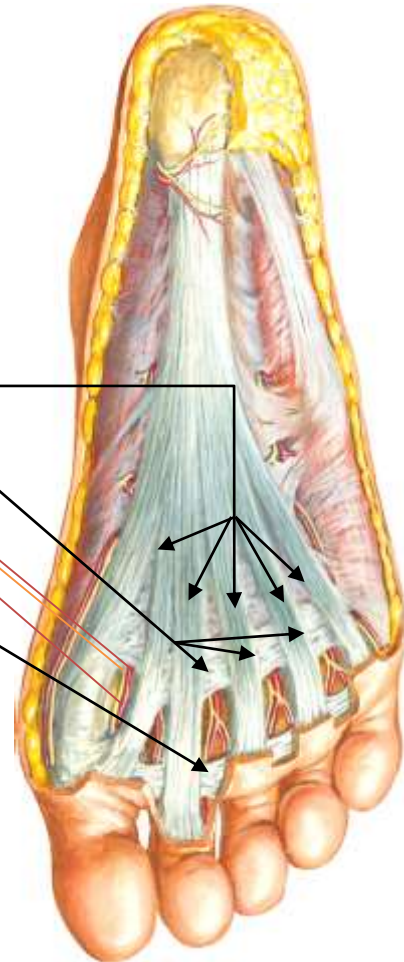
- **Attachments:**

- (1) its Apex (narrow post. end) : is attached to med lateral tubercles.*
- (2) its base (broad ant. end) : divides near the heads of metatarsal bones into 5 slips (one for each toe)

- these slips are connected by transverse fascial bands
- the space between each 2 slips contains
 - (a) lumbrical m
 - (b) plantar digital n
 - (c) plantar metatarsal a.
- near the toes , the slips are crossed by the superficial transv.metatar lig
- finally each slip divides opposite the M.P. joint into 2 parts which blend with the fibrous flexor sheath of the corresponding toe
- (3) the med.& lat. margins of the central part send med.& lat. septum respectively, which extend deeply into the sole, on each side of flexor digitorum brevis muscle

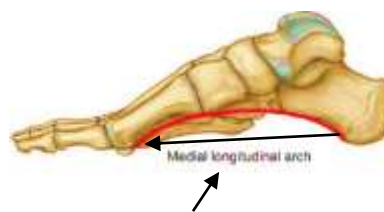
(B) The lateral thin part covers abductor digiti minimi muscle.

(C) The medial thin part covers abductor hallucis m.& is continuous proximally with the fl. retinacular.



*Functions of the plantar aponeurosis:

- 1- fixes the skin of sole and protects the deeper structures .
- 2- gives origin to the muscles of the 1st layer of the sole.
- 3- helps in maintaining the longitudinal arches of the foot (forming its tie beam).



Layers of the sole

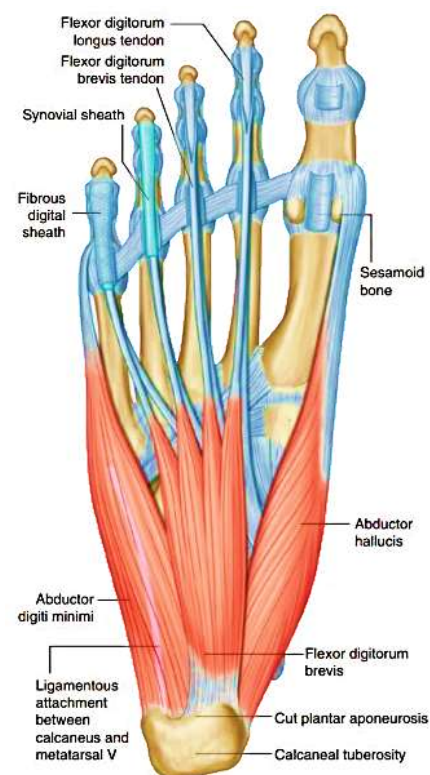
-The muscles and tendons of the sole are arranged in 4 layers, separated by

Layers of fascia in which plantar vessels and nerves lie.

First layer	Second layer	Third layer	Fourth layer
Contains 3 muscles	2 muscles and 2 tendons	3 muscles	2 muscles and 2 tendons
1- abductor hallucis 2- abd.digiti minimi 3- flexor digitorum brevis	- four lumbrical muscles - flexor accessorius m	- adductor hallucis m. - flexor hallucis brevis - flex.digiti minimi brevis	- plantar interossei - dorsal interossei
	* fl.hall.longus tendon * fl.digit.longus tendon		* peroneuslongus tendon * tibialis post-tendon

1- The first layer of the sole

M	Origin	Insertion	N.	Action
Abd.hallucis	(1) med.tubercle of calc. (2) flexor retinaculum. (3) plantar aponeurosis	By a strong tendon into the med.side of base of the proximal phalanx of the big toe	Medial plantar nerve	(1) abducts big toe (2) maintains the med.longitudinal arch of the foot.
Flex.digit.brevis	(1) med.tubercle of calc. (2) plantar aponeurosis.	* divides into 4 tendons for the lat.4 toes. * each tendon is inserted into the sides of the base of the middle phalanx		(1) flexion of the lat.4 toes
Abd.digiti minimi	(1) Med.and lat.tubercles of calcaneus. (2) Plantar aponeurosis	* lat.side of base the proximal phalanx of the little toe.	* lat.plantar n.	(1) abduction of the little toe



N.B: the tendons of flex. digit. bervis resemble flex. digit. superficialis of the hand:

Each tendon divides into 2 slips which decussate to form a tunnel for the passage of the flexor digit. longus tendon.

2- The Second layer of the sole

(A) 2 tendons:

(1) Tendon of flexor hallucis longus:

- passes deep to the tendon of flexor digitorum longus.
- at the point of crossing, it gives a slip to the fl. digit. longus.
- then it passes forwards grooving the lower surface of the flexor hallucis brevis then between 2 sesamoid bones present in the tendons of that muscle.
- finally, it is inserted into the plantar surface of the base of the distal phalanx of the hallux.

(2) Tendon of flexor digitorum longus:

- crosses superficial to the tendon of flexor hallucis longus.
- it divides into 4 slips passing to their insertion in the bases of terminal phalanges of the lat.4 toes.
- to reach their insertion, they perforate the tendons of flexor digitorum brevis.

(B) 2 Types of muscles:

(1) Flexor accessorius muscle:

- Origin:
 - lat. head: from inf. surface of calcaneus.
 - med. head: from med. surface of calcaneus.
- Insertion: lat. margin of tendon of flexor digitorum longus.
- N. supply: lat. plantar n.
- Action: it corrects (straightens) the oblique line of pull of flex. digit. longus tendon.

(2) Four lumbrical muscles:

- Origin:
 - the 1st is unipennate arising from the fl. digit. longus tendon of 2nd toe.
 - the 2nd, 3rd & 4th are bipennate, arising from the adjacent sides of the tendons of the digit. longus to the 3rd, 4th & 5th toes.
- Insertion: they pass upwards across the med. side of the M. P. Joints to blend with the extensor expansions on the dorsum of the lat.4 toes.
- N. Supply:
 - the 1st (medial) lumbrical is supplied by the med. plantar n.
 - the 2nd, 3rd & 4th lumbrical are supplied by the lat. plantar n.
- Action: flexion of the M.P. & extension of the I. P. Joints of the lat.4 toes.



3- Third layer of the sole

- It contains 3 muscles (2 flexors & one adductor):

(1) Flexor Hallucis brevis (F. H. B):

***Origin:** plantar surface of cuboid & lat. cuneiform bones.

***Insertion:** the muscle splits into 2 tendons (med. & lat.) which are inserted into both sides of base of the proximal phalanx of big toe.

N.B: each tendon contains a sesamoid bone.

***N. supply:** med. plantar n.*

***Action:** flexes the M.P Joint of big toe.

(2) Flexor Digiti minimi Brevis

***Origin:** med. side of base of 5th metatarsal bone.

***Insertion:** lat. side of base of proximal phalanx of little toe.

***N. Supply:** lat. plantar n.

***Action:** flexes the M. P. Joint of the little toe.

(3) Adductor Hallucis:

***Origin:** by 2 heads.

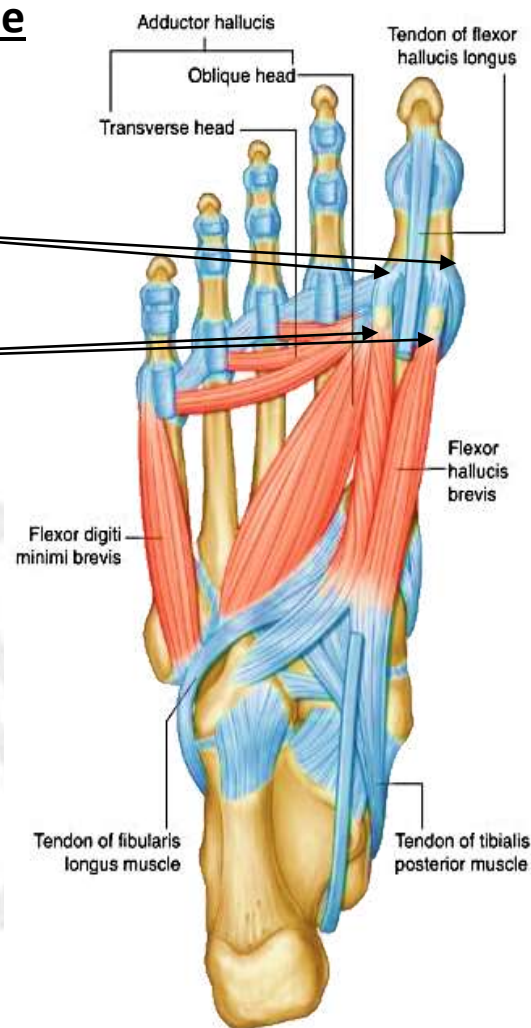
(a) oblique head: from bases of 2nd, 3rd & 4th metatarsal bones.

(b) transverse head: from capsules & ligaments of the lat. 4 M.P joints.

***Insertion:** lat. side of base of proximal phalanx of big toe.

***N. Supply:** lat. plantar n.

***Action:** (1) the oblique head: adducts the big toe
(2) the transverse head: helps to maintain the transverse arch of the foot by drawing the roots of toes closer.



4- Fourth layer of the sole

Contains:

(A) 2 types of muscles: -Dorsal interossei.

-plantar interossei.

(B) 2 tendons: -peroneus longus tendon.

-tibialis posterior tendon.

(1) Dorsal interossei:

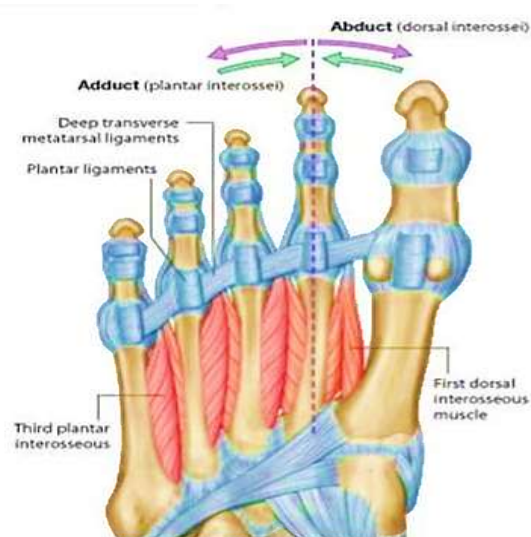
are 4 in number & are bipennate.

***Origin:** from adjacent sides of metatarsal bones.

***Insertion:** bases of proximal phalanges & extensor expansions of the respective toes (2nd, 3rd & 4th)

***N. Supply:** lat. plantar n.

***Action:** adduct the 2nd, 3rd & 4th toes away from the middle line of the 2nd toe (axis of abd. & add.*



(2) Plantar interossei: are 3 in number and unipennate.

***origin:** shafts of 3rd, 4th, 5th metatarsal bones.

***Insertion:** extensor expansion and base of the corresponding toe.

***Nerve supply:** lat. plantar n.

***Action:** adduct the 3rd, 4th, 5th toes towards the middle line of the middle toe (axis of the foot).

(3) Tendon of peroneus longus:

- runs obliquely across the foot in the groove of cuboid bone, undercover of the long plantar lig.

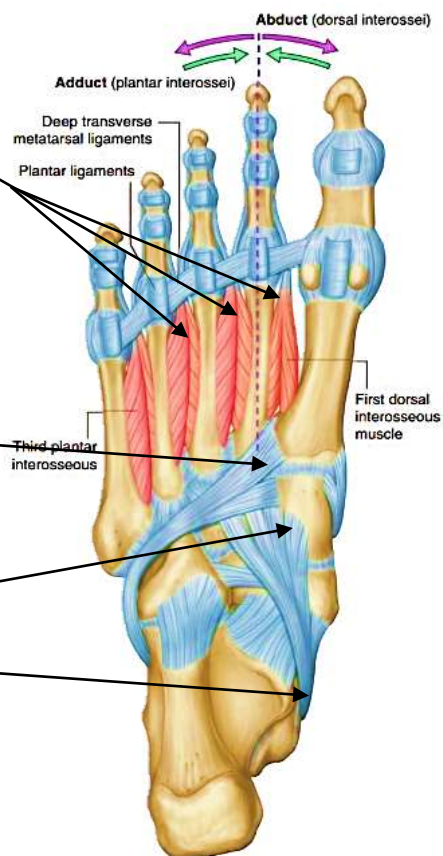
- inserted into base of 1st metatarsal & adjoining part of med. cuneiform.

(4) Tibialis posterior tendon:

it divides into:

a- Large med. part: inserted into the tuberosity of navicular (mainly) & med. cuneiform (partly)

b- Small lat. part: divides into many slips which are inserted into the other tarsal bones (except talus) & into the bases of the 2nd, 3rd, 4th metatarsal bones.



***General remarks about n. supply of the sole:**

(1) Medial plantar n. (like median n. in the hand): supplies

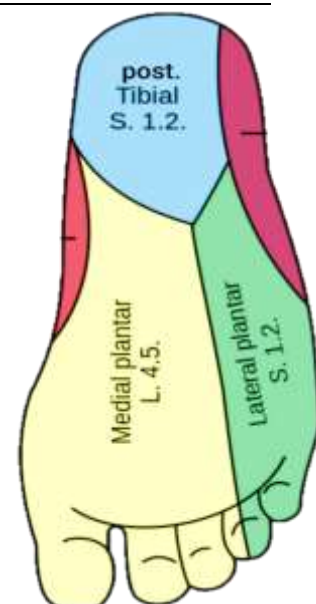
- a- few muscles (4):
- 1- Abd. H. → abd. hallucis m.
 - 2- F. H. B → flex. hallucis brevis.
 - 3- F. D. B → flex. digit. brevis.
 - 4- 1st lumb. → first lumbrical.

b- Large skin area: med. $\frac{2}{3}$ of sole + med. $3\frac{1}{2}$ toes.

(2) Lateral plantar n. (like ulnar n. in the hand): supplies:

a- many muscles: all the remaining muscles of the sole (**14** muscles).

b- small skin area: Lat. $\frac{1}{3}$ of sole + lat. $1\frac{1}{2}$ toes.

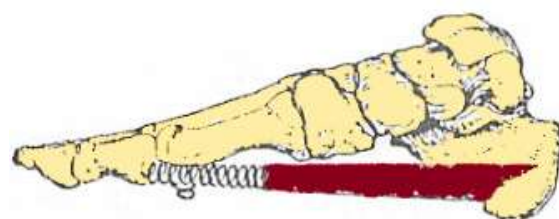


***General remarks about action of muscles of the sole:**

(1) their tone helps to maintain the arches of the foot.

(2) they steady the toes particularly when the foot is on the ground (i.e. under load).

(3) they have specific actions (indicated by their names).



Arterial supply of L.L

1- femoral artery:

***origin:** begins behind the midinguinal point as a continuation of the external iliac a.

***course:** -its upper $\frac{1}{2}$ lies superficial in the femoral triangle.

-its lower $\frac{1}{2}$ lies deep in the subsartorial (adductor) canal.

***Termination:** at the junction of upper $\frac{2}{3}$ & lower $\frac{1}{3}$ of thigh by passing through the adductor hiatus to continue as popliteal a.

*Relations in the femoral triangle:

it traverses the triangle from its base to its apex.

- Anteriorly:

- (1) skin, superficial and deep fascia.
- (2) ant. wall of femoral sheath (in upper 4 cm).
- (3) femoral br. of genito femoral n. (in the upper part).
- (4) med. cut. n. of the thigh crosses the femoral a. from lat. to med. near the apex of femoral triangle).

- Posteriorly: (from above downwards):

- (1) post. wall of the femoral sheath.
- (2) psoas major m. (separating it from hip joint).
- (3) pectineus.
- (4) profunda vessels.
- (5) adductor longus m. & femoral v. in front of it.

- Laterally: femoral n. & its branches.

- Medially: femoral v. (in the upper part of the triangle)

*Relations in the subsartorial canal:

- Anteromedially:

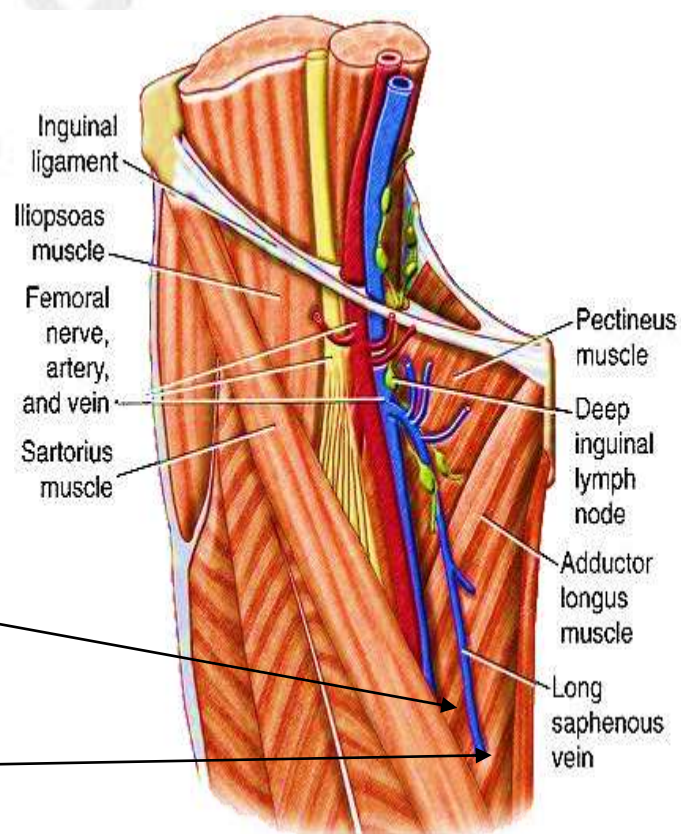
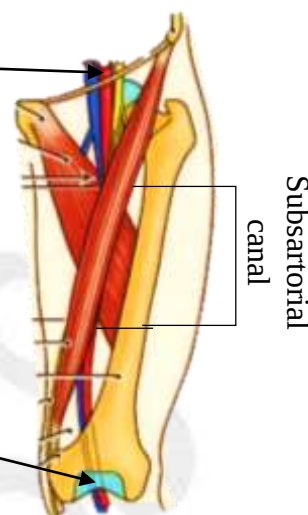
- (1) skin, superficial & deep fascia.
- (2) sartorius & the fibrous roof of subsartorial canal.
- (3) saphenous n. (crosses the artery from lat. to med.)

- Posteriorly:

- (1) adductor longus & adductor magnus.
- (2) femoral v. (in the upper part of the canal)

-Laterally:

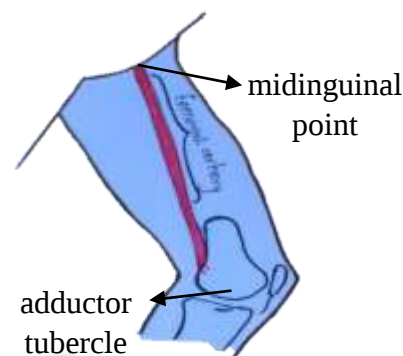
- (1) vastus medialis & its nerve.
- (2) femoral vein (in the lower part of the canal).



* Surface anatomy of femoral artery:

it is represented by the upper $\frac{2}{3}$ of a line Connecting the following 2 points:

- 1- midinguinal point (a point midway between A.S.I.S and symphysis pubis)
- 2- adductor tubercle (lies at the lower end of cord-like tendon of adductor magnus when the thigh is semiflexed, abducted and laterally rotated).



Branches of femoral artery

3 Superficial brs.

- superficial epigastric a.
- superficial circumflex iliac.
- superficial external pudendal

3 Deep brs.

- deep external pudendal.
- profunda femoris.
- descending genicular a.

(1) Superficial epigastric a. :

- arises 1 cm below the inguinal lig.
- pierces the cribriform fascia then ascends superficial to the inguinal lig. towards the umbilicus.
- it supplies the superficial structures of the ant. abdominal wall
- it ends by anastomosing with the inf. epigastric a. .

(2) Superficial circumflex iliac a. (the smallest superficial br .) :

- pierces the fascia lata and runs laterally below & parallel to the inguinal lig. till it reaches the A.S.I.S where it shares in the anastomosis around it.

(3) Superficial external pudendal a.

- pierces the cribriform fascia and runs medially in front of spermatic cord, & deep to long saphenous v. to supply the skin of external genitalia

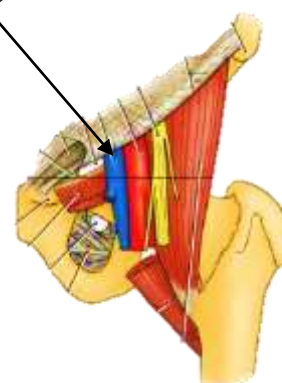
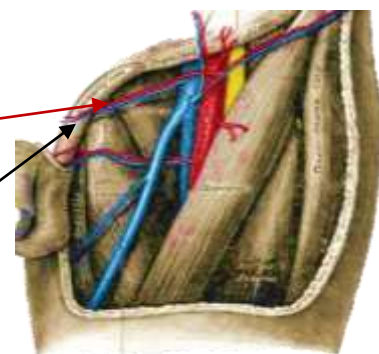
(4) Deep external pudendal a. :

- arises from the med. side of femoral a. $\frac{1}{2}$ an inch below inguinal lig.
- passes medially on pectineus & adductor longus (behind or in front of femoral v.)
- then it pierces the fascia lata to supply the external genitali a.

(5) Descending genicular a. :

- it is the only br. of femoral a. arising in the adductor canal (Just above the adductor hiatus). It divides into 2 branches:

- (a) Saphenous br: accompanies the Saphenous n.
- (b) articular br.: enters vastus medialis to reach the knee where it shares in anastomosis there.



6- Profunda femoris artery

(deep femoral artery)

It is the largest br. of femoral a. & the main blood supply of the thigh

***origin:** from the posterolat. aspect of femoral a. 4 cm below inguinal lig.

***Course & relations:**

- at its origin it lies on the iliopsoas tendon.
- then it curves downwards & medially behind femoral vessels, lying on pectineus.
- it leaves the femoral triangle by passing between pectineus & adductor longus.
- then it descends deep to adductor longus, lying on the adductor brevis then adductor magnus.

N.B: the add.longus separates femoral vessels (ant. to it) from the profunda vessels (post. to it)
the profunda v. lies ant. to the profunda a.

* the profunda a. **ends** by becoming the 4th perforating a. which pierces the add. magnus m. close to the femur.

***Branches of the profunda femoris a .**

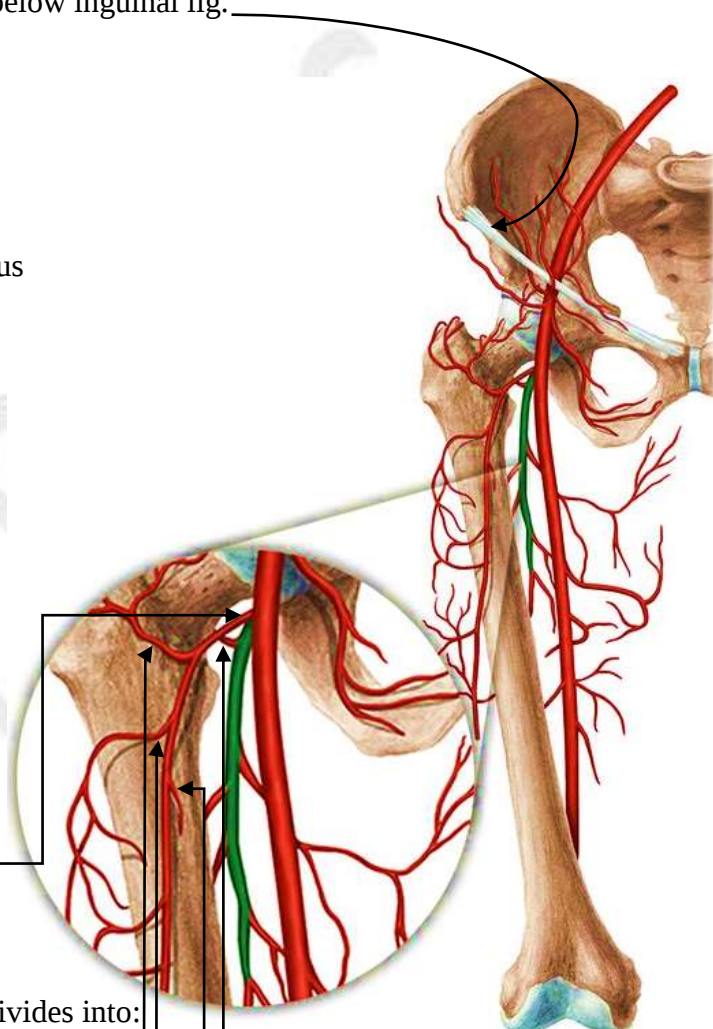
(1) Lateral circumflex femoral a. :

- runs laterally through the branches of the femoral n . (dividing them into superficial & deep **branches**).
- disappears deep to Sartorius & rectus femoris where it divides into:

- ascending br.: ascends undercover of tensor Fascia lata to reach the A.S.I.S to share in the anastomosis there.
- transverse br. : passes laterally then pierces vastus lateralis to wind round the femur just below the greater trochanter to reach the cruciate anastomosis.
- descending br.: descends along the ant. border of vastus lateralis (accompanied by n. to vastus lateralis) to share in the anastomosis around the knee.

(2) Medial circumflex femoral a.:

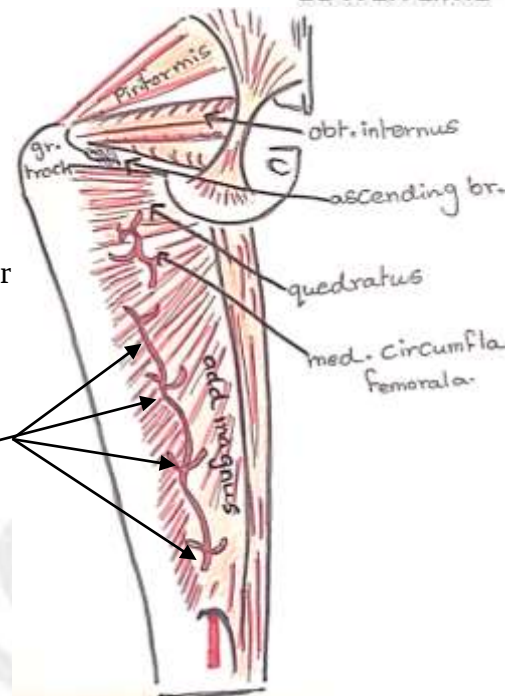
- passes posteriorly between **psoas** & **pectineus** muscles to reach the back of thigh where it appears between quadratus femoris & add. magnus where it ends by dividing into 3 branches



- (a) ascending br. : accompanies the tendon of obturator externus to reach the trochanteric fossa sharing in the trochanteric anastomosis.
- (b) acetabular br. : enters the acetabular foramen deep to the tracetabular lig. & sends a br. along the round lig of femur to supply its head.
- (c) transverse br.: passes transversely to reach the cruciate anastomosis.

(3) perforating branches of the profunda femoris:

- the first 3 are branches of the profunda while the 4th perforating a. is the continuation of the profunda itself.
- they perforate the insertion of add. brevis & add. magnus muscles to reach the back of the thigh where they anastomose together forming a longitudinal chain which supplies the muscles of the post. compartment.



Other arteries of the thigh & gluteal region:

(1) Superior gluteal a.

- arises inside the pelvis as a. br. of internal iliac a.
- emerge through the greater sciatic foramen above piriformis.
- in the gluteal region it divides into 2 branches:
- (a) superficial br.: enters the deep surface of gluteus maximus.
- (b) deep br.: passes forwards between glut. med. & glut. minimus in company with sup. gluteal n.

(2) Inferior gluteal a. :

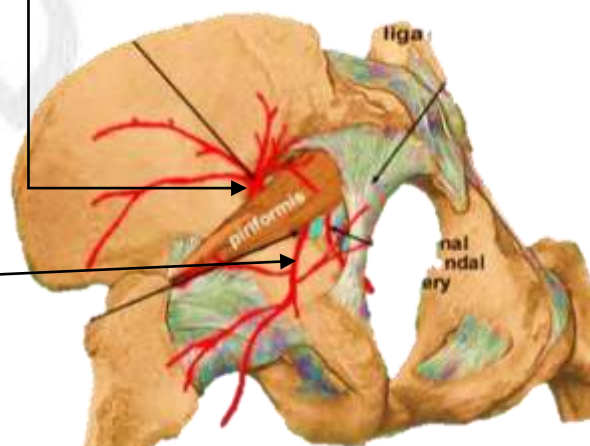
- arises inside the pelvis as a. br. of internal iliac a.
- emerges from the greater sciatic f. below piriformis.
- it supplies gluteus maximus m. & gives the following branches:
- (a) accompanying br. to the sciatic n.
- (b) articular br. to the hip joint.
- (c) anastomotic brs. to the trochanteric & cruciate anastomoses.

(3) Obturator a.:

- arises inside the pelvis as a. br. of internal iliac a.
- enters the thigh by passing through the obturator foramen (accompanying obturator n.).
- divides into ant. & post. brs. which run along the margins of the obturator foramen & join each other in the form of a circle on the outer surface of the obturator membrane.

-Branches:

- (a) ant. & post. brs. which anastomose together.
- (b) acetabular br. (from the post. division): enters the hip joint via acetabular notch.
- (c) pubic br. : anastomoses with the pubic br. of inf. epigastric a. on the back of pubis.



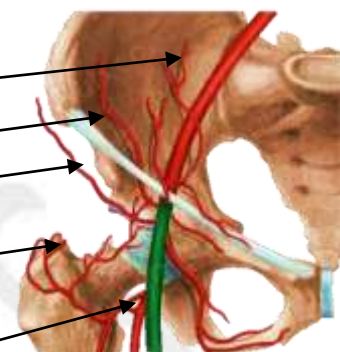
Collateral circulation (anastomosis) of the thigh:

(A) Anastomosis around the A.S.I.S:

- is a relatively rich anastomosis between the following brs. :

- (1) br. from the sup. gluteal a. (from internal iliac a.).
- (2) deep circumflex femoral a. (from external iliac a.).
- (3) superficial circumflex femoral a. (from femoral a.).
- (4) ascending br. of lat. circumflex femoral (br. of profunda).

-This anastomosis provides a collateral anastomosis in case of obstruction of external iliac or femoral above the origin of profunda a.



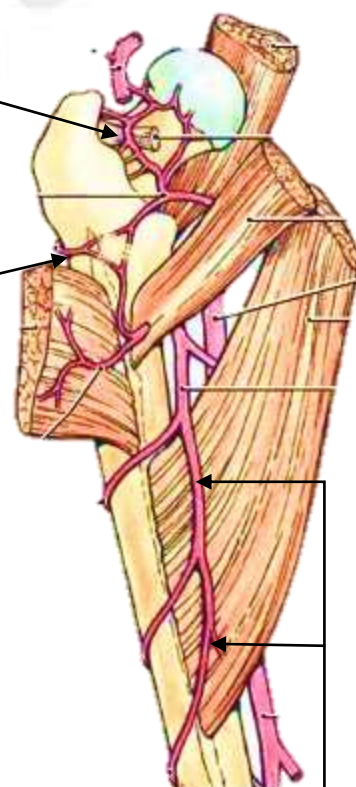
(B) Trochanteric anastomosis:

-it is a rich anastomosis lying in the floor of the trochanteric fossa.

-it is formed by the following branches:

- (1) br. from sup. gluteal a. } from internal iliac a.
- (2) br. from inf. gluteal a. }
- (3) ascending br. of lat. circumflex femoral } from profunda femoris a.
- (4) ascending br. of med. circumflex femoral }

importance: it supplies retinacular arteries to the head of femur & connects the internal iliac a. with femoral a.



(C) cruiate anastomosis:

- it is a rich anastomosis resembling a cross (+) situated in the upper part of back of thigh at the level of the lesser trochanter.

- it is formed by the following branches:

- (1) transverse br. of med. circumflex femoral a. } forming the transverse part of the cross.
- (2) transverse br. of lat. circumflex femoral a. }
- (3) descending br. of inf. gluteal a. (of int. iliac a.) } forming the vertical part of the cross.
- (4) ascending br. of 1st perforating a. of profunda }

importance: it forma a connection between the internal iliac & femoral a.

(D) The anastomosis on the back of thigh:

- it is a relatively rich anastomosis on the back of thigh formed by the perforating branches of the profunda femoris a.

- it is continuous above with the cruiate anastomosis.

- it is continuous below with the anastomosis around the knee.

- it connects the internal iliac artery above with the popliteal a. below.

Popliteal artery

***Origin:** continuation of the femoral a. at the adductor hiatus
(at the junction of the middle & lower thirds of the thigh).

***Course:** it runs downwards & slightly laterally as the deepest
(most ant.) structure in the popliteal fossa (in contact with its foot)

***Termination:** at the lower border of popliteus m. by dividing
into ant. & post. tibial arteries.

***Relations:**

(A) Anterior (deep) relations:

- popliteal surface of femur.
- back of capsule of knee joint.
- fascia covering popliteus m.

(B) Posterior (superficial):

1- in the upper part: it is overlapped by semimembranosus m.

2- at the center of the fossa it is crossed from Lat. to med.
by the popliteal v. & tibial nerve.

3- in the lower part: it is overlapped by gastrocnemius
& plantaris muscles.

(C) lateral relations:

1- in the upper part: biceps m. popliteal v. & tibial n.

2- in the lower part: plantaris & lat. head of gastrocnemius.

(D) medial relations:

1- in the upper part: semimembranosus & semitendinosus m.

2- in the lower part: tibial v. popliteal v.
& Med. head of gastrocnemius m.

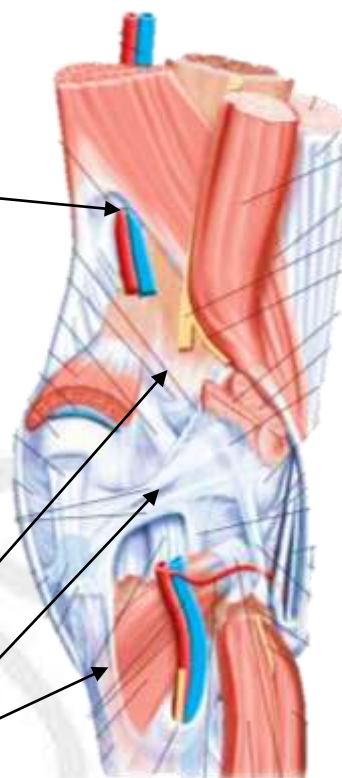
N.B:

- the popliteal v. crosses superficial to the popliteal a.
from lat. to med. (from love to Marriage).
- the tibial n. crosses superficial to the popliteal vessels
(a. & v.) also from lat. (above) to med. (below).

***Surface anatomy:**

it is represented by a line connecting the following 2 points:

- 1- a point on the med. side of back of thigh, at the junction
of middle & lower thirds medial to the middle line.
- 2- a point on the middle line of back of leg at the level of tibial tuberosity.



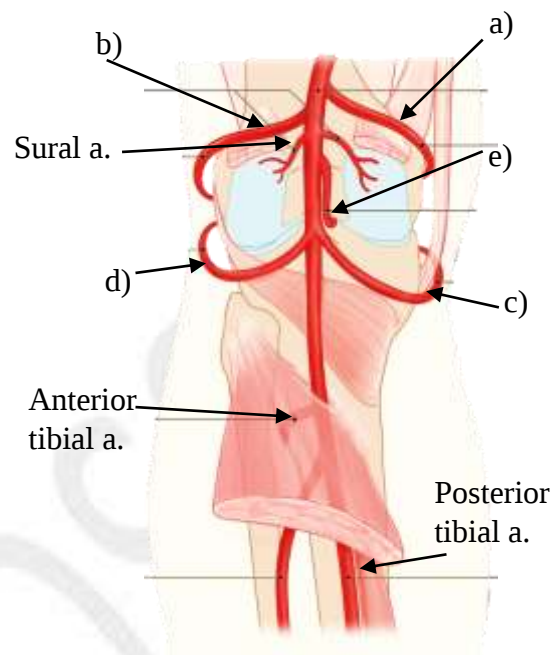
*Branches of the popliteal artery:

1- **Muscular brs.** to hamstring & calf muscles

2- **Five genicular branches:**

- | | | |
|---|---|---|
| a) sup. med. genicular | } | arise above the condyles femur & wind round lower end of femur. |
| b) sup. lat. genicular | | |
| c) inf. med. genicular | } | arise below the tibial condyles & wind round upper end of tibia |
| d) inf. lat. genicular | | |
| e) middle genicular a. : pierces the oblique popliteal lig. to supply the cruciate ligaments & synovial membrane. | | |

3- **Sural a.:** a small cutaneous br. accompanying sural n.
 .2 Terminal branches: ant. tibial & post. tibial a.



*Anastomosis around the knee

It is a rich anastomosis around the knee formed by branches from femoral, popliteal, ant. & post. tibial arteries.

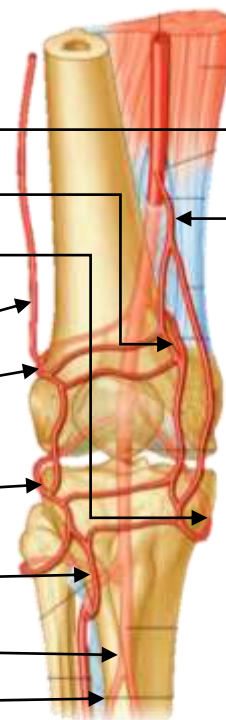
It is arranged as med. & lat. longitudinal channels along med. & lat. Sides of the knee & connected by cross anastomosis:

(A) **The medial longitudinal channel** is formed of

- 1- descending genicular a. : from femoral a.
- 2- sup. med. genicular a. : from popliteal a.
- 3- inf. med. genicular a.: from popliteal a.

(B) **The lateral longitudinal channel** is formed of

- 1- descending br. of lat. circumflex femoral of profunda.
- 2- sup. lat. genicular a. : from popliteal a.
- 3- inf. lat. genicular a.: from popliteal a.
- 4- ant. tibial recurrent a. : from ant. tibial a.
- 5- post. tibial recurrent a. : from ant. tibial a.
- 6- circumflex fibular a. : from post. tibial a.



Applied anatomy:

Popliteal a. is more liable to aneurysm formation than other arteries in the body because:

- 1- constant pulsations of the artery against the add. magnus tendon at the add. hiatus leads to changes in the vessel wall (weakness).
- 2- popliteal a. is fixed to the capsule of knee joint by a fibrous band just above femoral condyles (this may cause continuous traction on the artery).

Anterior tibial artery

***Origin:** at the lower border of popliteus m.
as the smaller of the 2 terminal brs. of the popliteal a.

***Course:**

- at its origin it lies in the post. compartment of leg.
- it passes forwards through an opening on the upper part of interosseous membrane to reach the ant. compartment lying med. to neck of fibula. *
- in the upper part of its course it lies very deep in front of the interosseous membrane.
- in the lower part it deviates medially to lie in front of the lower part of tibia.

***Termination:** it ends in front of ankle joint midway between the 2 malleoli by becoming the dorsalis pedis a.

***Relations:**

1- It's upper 1/3

- * Medially: tibialis ant. m.
- * Laterally: ext. digitorum longus & ant. tibial n.
- * Posteriorly: interosseous memb.
- * Anteriorly: skin, fascia & extensor m.

2- its middle 1/3

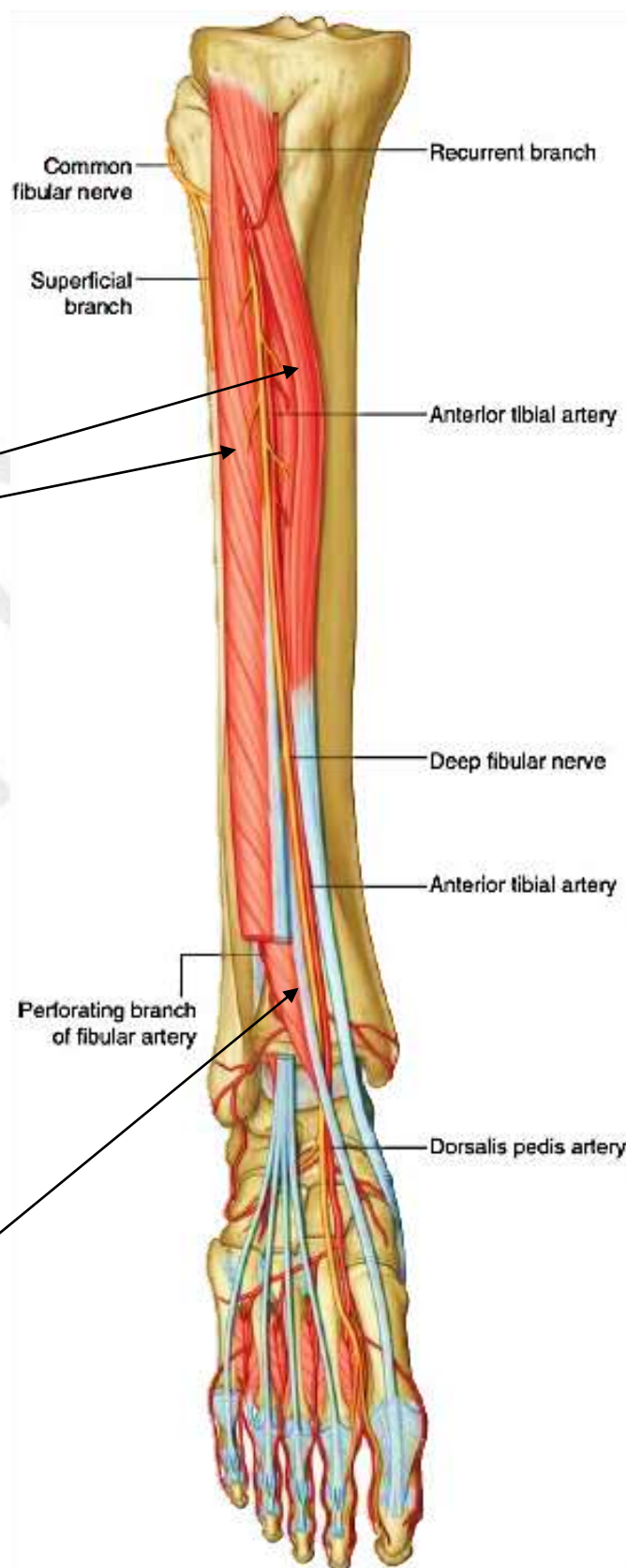
- * Medially: tibialis ant.
- * Laterally: ext. hallucis longus.
- * Posteriorly: interosseous memb.
- * Anteriorly: skin, fascia, extensor muscles+ anterior tibial n.

3- it's lower 1/3

- * Medially: ext. H. longus: crosses the a. from lat. to med. just above ankle.
- * Laterally: ext. digit. longus+ ant. tibial n.
- * Anteriorly: skin, Fascia + ext. Hall. longus.
- * Posteriorly: lower end of tibia.

N.B:

- (1) the artery is accompanied by 2 venae comitantes throughout its course.
- (2) The ant. tibial n. has tripple relation with the ant. tibial a.
 - a) in the upper 1/3 : the nerve lies lat. to the artery.
 - b) in the middle 1/3 : the nerve lies in front of the artery.
 - c) in the lower 1/3 : the nerve returns lat. to the artery again.



*Branches of ant. tibial a. :

- 1) post. tibial recurrent a. : arises in the post. compartment of leg. } share in the anastomosis around the knee joint.
- 2) ant. tibial recurrent a. : arises in the ant. compartment of leg. }
- 3) muscular brs. : to the muscles of the ant. compartment of leg.
- 4) ant. med. malleolar: arises 5 cm above the ankle , passes deep to the tendons of tendons of tibialis ant. And ext. hallucis longus to reach the med. side of the ankle where it shares in the anastomosis there.
- 5) ant. lat. malleolar: runs deep to the tendons of ext. digitorum & peroneus tertius to reach the lat. side of the ankle sharing in the anastomosis there.

Dorsalis pedis artery

* **Begins:** in front of ankle joint, midway between the 2 malleoli as a continuation of ant. tibial a.

* **Course:** it passes forwards on the dorsum of the foot.

* **Ends:** by passing downwards in the proximal part of the 1st interosseous space to reach the sole of the foot & anastomosis with the end of the plantar arch.

* Relations:

A) **deep R. :** it crosses

- neck of talus.
- navicular bone.
- intermediate.

B) **superficial R. :**

- skin, superficial & deep fascia.
- inf. ext. retinac. crossing its proximal part.
- ext. hallucis brevis crossing its distal part.

C) **medially:** extensor hallucis lingus tendon.

D) **laterally:** med. tendon of ext. digitorum longus
med. division of anterior tibial nerve.

* Branches:

1) **med. tarsal a.** } Both arise immediately below the ankle & run medially & laterally respectively to share in the

2) **lat. tarsal a.** }

3) **Arcuate a.:**

- arises near the med. cuneiform bone & curves laterally opposite the bases of metatarsal bones deep to the ext. digit. tendons.
- it gives the 2nd , 3rd & 4th dorsal metatarsal arteries which pass to the clefts between the toes & each artery divides into 2 dorsal digital brs. to adjacent sides of 2 toes.

4) **1st dorsal metatarsal a.:**

arises from dorsalis pedis before it sinks into the sole.

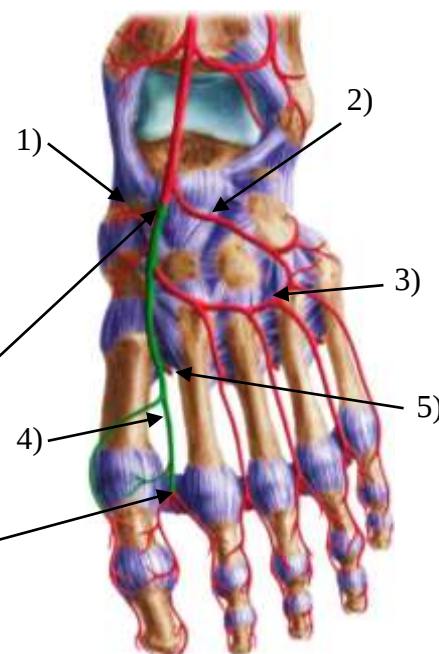
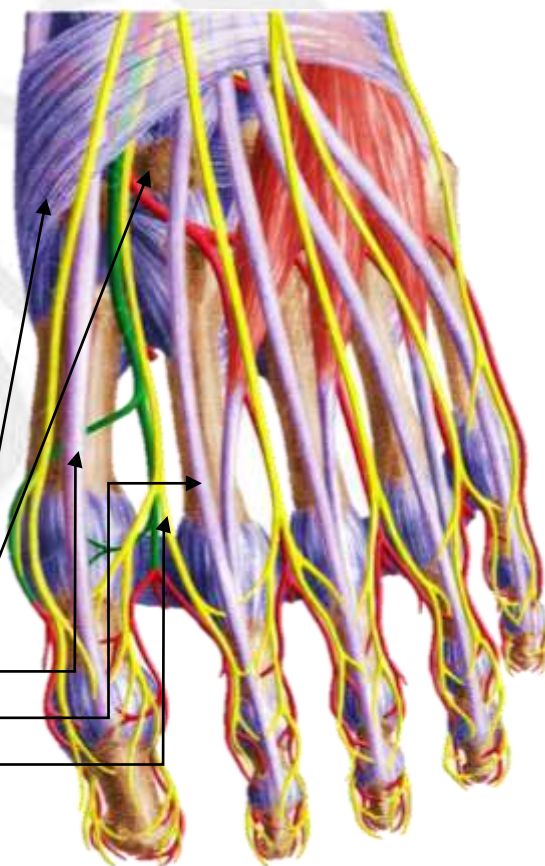
5) **1st plantar metatarsal a.:**

arises from dorsalis pedis a. in the sole.

* **Surface anatomy:**

represented by a line between 2 points:

- A) a point in front of ankle midway between the 2 malleoli.
- B) a point at the proximal end of the 1st metatarsal space.



Posterior tibial artery

* **Begins:** at the lower border of popliteus m. as the larger of the 2 terminal branches of the popliteal a.

* **Ends:** deep to the flexor retinaculum
midway between med. malleolus & calcaneus by dividing into med. & lat. plantar arteries.

* **Course:**

- (1) it descends deep to the tendinous arch of soleus (between tibia & fibula) with post. tibial n.
- (2) it runs downwards in the back of the leg between the superficial & deep calf muscles.
- (3) in the lower part of the leg it lies on the back of the lower end of tibia & capsule of the ankle joint.

* **Relations:**

(A) **Deep relations:** from above downwards it runs on:

- (1) tibialis post. m. (in its upper $\frac{2}{3}$)
- (2) back of lower part of tibia (in its lower $\frac{1}{3}$).
- (3) back of the ankle joint (in its lower $\frac{1}{3}$).

(B) **Superficial (post.) relations:** it is covered by:

- 1- gastrocnemius & soleus muscles: in the upper $\frac{2}{3}$.
- 2- skin & fascia only: in the lower $\frac{1}{3}$.
- 3- flexor retinaculum: at its lower end.

(C) **Laterally:** flexor hallucis longus muscle.

(D) **Medially:** flexor digitorum longus muscle.

(E) **Relations to post. tibial n.** (from Marriage to Love!!):

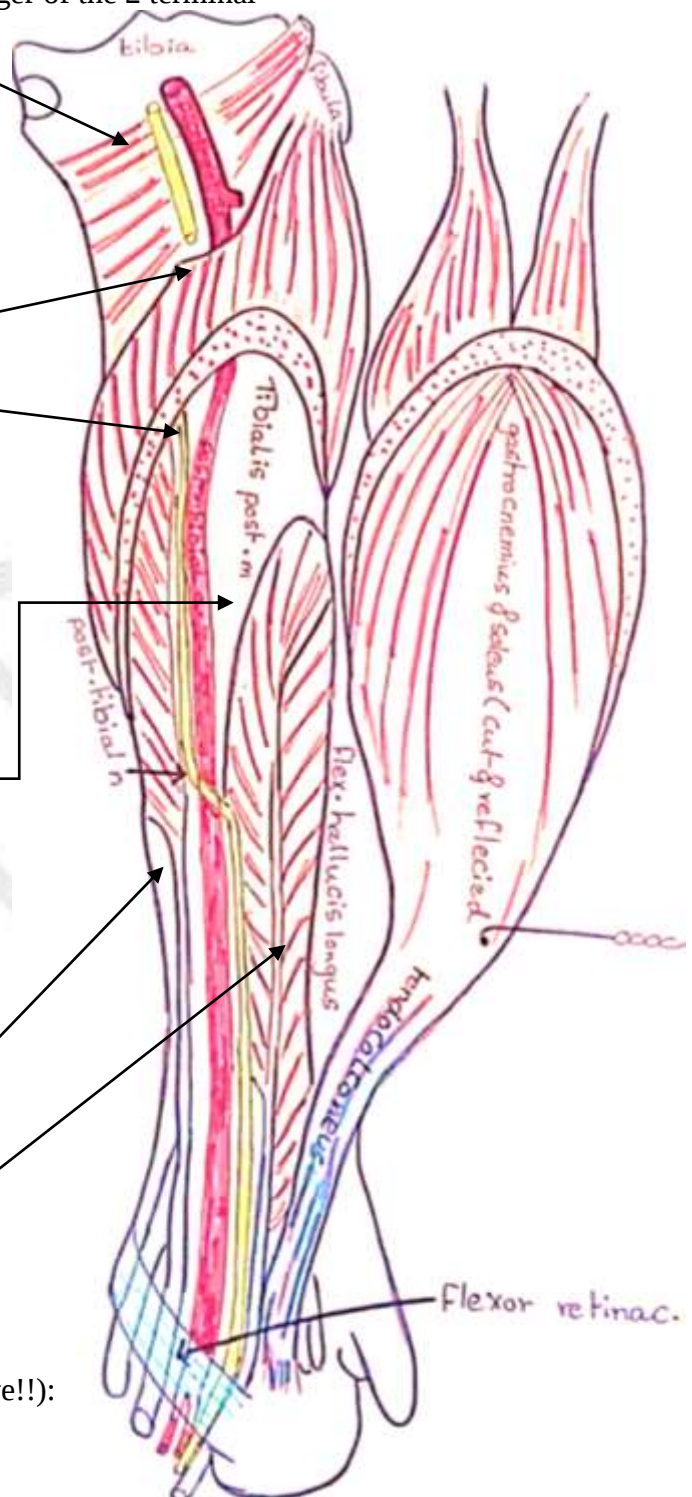
- (1) in the upper part: the nerve lies **Medial** to the artery.
- (2) in middle part: the n. crosses superficial to the artery.
- (3) in the lower part: the nerve lies **Lat.** to the artery.

N.B: the artery is accompanied by 2 venae comitantes.

* **Surface anatomy:**

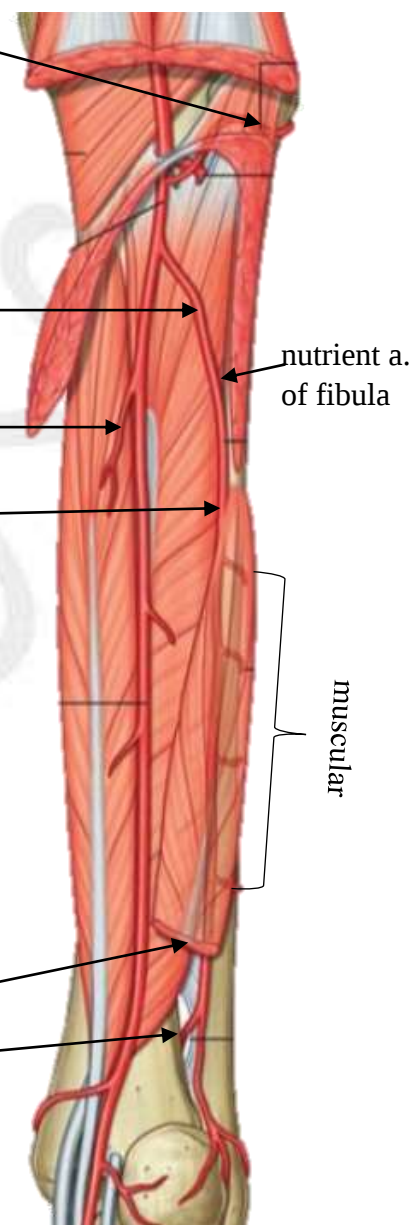
it is represented by a line joining the following 2 points:

- (1) a point on the middle line of the back of leg at the level of tibial tuberosity.
- (2) a point midway between med. malleolus & tendo calcaneus.



Branches of post. tibial a. :

- (1) **circumflex fibular a. :** winds round lat. aspect of neck of fibula & shares in the anastomosis around the knee.
- (2) **Peroneal a.:** see below.
- (3) **muscular brs. :** to the muscle of back of leg.
- (4) **nutrient a. of tibia :** (the largest nutrient a. in the body).
- (5) **communicating br. :** runs across the back of the lower end of tibia to join a similar br. from the peroneal a.
- (6) **med. malleolar:** ramifies on the med. malleolus.
- (7) **med. calcanean:** ramifies on the med. side of calcaneus.
- (8) **2 terminal brs. :** lat. & med. plantar arteries.



Peroneal artery

* It is the largest & longest br. of post. tibial a (main supply of leg).

* **Origin:** arise 1 inch below the beginning of the post. tibial a.

* **Course:** it descends downwards & laterally to reach the fibular where it runs down along its med. crest between tibialis post. & flexor hallucis longus muscle.

* **Termination:** behind the inf. tibio fibular joint by giving terminal calcanean branches.

* **Branches:**

- (1) muscular.
- (2) nutrient a. of fibula.
- (3) communicating br. : joins its fellow from post. tibial a.
- (4) perforating br. : pierces the interosseous memb. 2" above ankle to reach the ant. compartment. it may replace the ant. tibial a.
- (5) lat. calcanean (terminal) brs. to lat. side of calcaneus.
- (6) lat. malleolar: share in the anastomosis around ankle joint. *

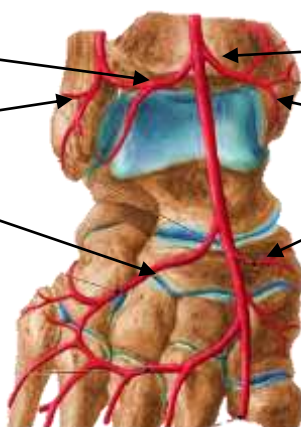
Anastomosis around ankle

Anastomosis around lat. malleolus:

- (1) ant. lat. malleolar (br. of ant. tibial).
- (2) lat. malleolar (from peroneal a.)
- (3) lat. tarsal (br. of dorsalis pedis).
- (4) lat. calcanean (from peroneal a.)
- (5) brs. from lat. plantar a.

Anastomosis around med. malleolus:

- (1) ant. med. malleolar (ant. tibial)
- (2) med. malleolar (post. tibial)
- (3) med. tarsal (br. of dorsalis pedis)
- (4) med. calcanean (post. tibial)
- (5) brs. from med. plantar a.



Lateral plantar artery

* **Begins:** undercover of the flexor retinaculum as the larger of the 2 terminal brs. of the post. tibial a. .

* **Ends:** by anastomosing with the terminal part of the dorsalis a. to complete the plantar arch.

* **Course & relations:**

(1) it passes obliquely forwards & laterally across the foot in the direction of the base of the 5th metatarsal bone, lying between the muscles of the 1st & 2nd layers of the sole, with lat. plantar n. med. to the artery.

(2) then the artery turns medially across the foot between the 3rd & 4th layers of the sole forming the plantar arch

The deep br. of lat. plantar n. lies in the concavity of the plantar arch

* **Branches of the plantar arch:**

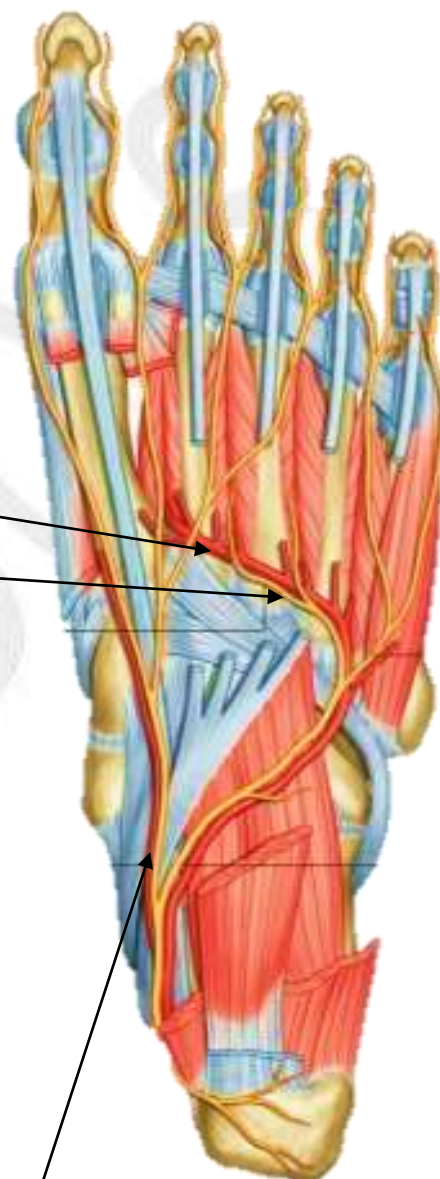
(1) **3 plantar metatarsal arteries** (the 2nd, 3rd, 4th) which pass to the clefts between the lat. 4 toes. Each artery divides into 2 plantar digital arteries supplying the adjacent sides of 2 toes.

N.B:

the 1st plantar metatarsal a. arises from dorsalis pedis a. as it enters the sole.

(2) **3 post. perforating arteries** which pass upwards through the proximal ends of the 2nd, 3rd & 4th interosseous spaces to anastomose with the dorsal metatarsal arteries.

(3) **plantar digital a.** for the lat. side of the little toe.



Medial plantar artery

* **Begins:** undercover the flexor retinaculum as the smaller of the 2 terminal branches of the post. tibial a.

* **course:** it runs forwards along the med. side of the medial plantar n. undercover of abductor hallucis muscle.

* **ends:** by joining the branch of the 1st plantar metatarsal a. to the med. side of the big toe.

* **Branches:** it gives off muscular brs. to the adjoining muscles.

Venous drainage of the L.L.

(1) Superficial veins: run in the superficial fascia accompanied by superficial lymphatics. They include:

(1) Dorsal venous arch:

- lies at the ant. part of dorsum of foot opposite the heads of the metatarsal bones.
- receives venous blood from the dorsum & margins of the foot & also from the sole (by veins piercing the interosseous spaces) drains medially into long saphenous v. & laterally into short saph. v.

(2) Long (great) saphenous vein:

* It is the longest vein in the body (about 80 cm).

* **Begins:** at the med. side of dorsum of foot as a continuation of the med. end of the dorsal venous arch of foot.

* **Course & relations:**

- (a) it ascends in front of med. malleolus, lying 2 finger breadth in front of its post. border (commonest site for venous cut down).
- (b) in the leg: it ascends along the med. border of tibia (behind the saphenous n.) to reach the post. part of med. side of knee (lying 4 finger-breadth behind post. border of patella).
- (c) in the thigh: it ascends vertically along its med. aspect, then crosses the roof of the femoral triangular to reach the saphenous opening.

* **Termination:** by piercing the cribriform fascia & the med. wall of the femoral sheath to end in the femoral vein.

* **Valves:** it contains 10-20 valves which are more numerous below knee. 2 valves are present in the upper end (one before the v. pierces the cribriform fascia & the other at the sapheno-femoral junction).

* **Tributaries:**

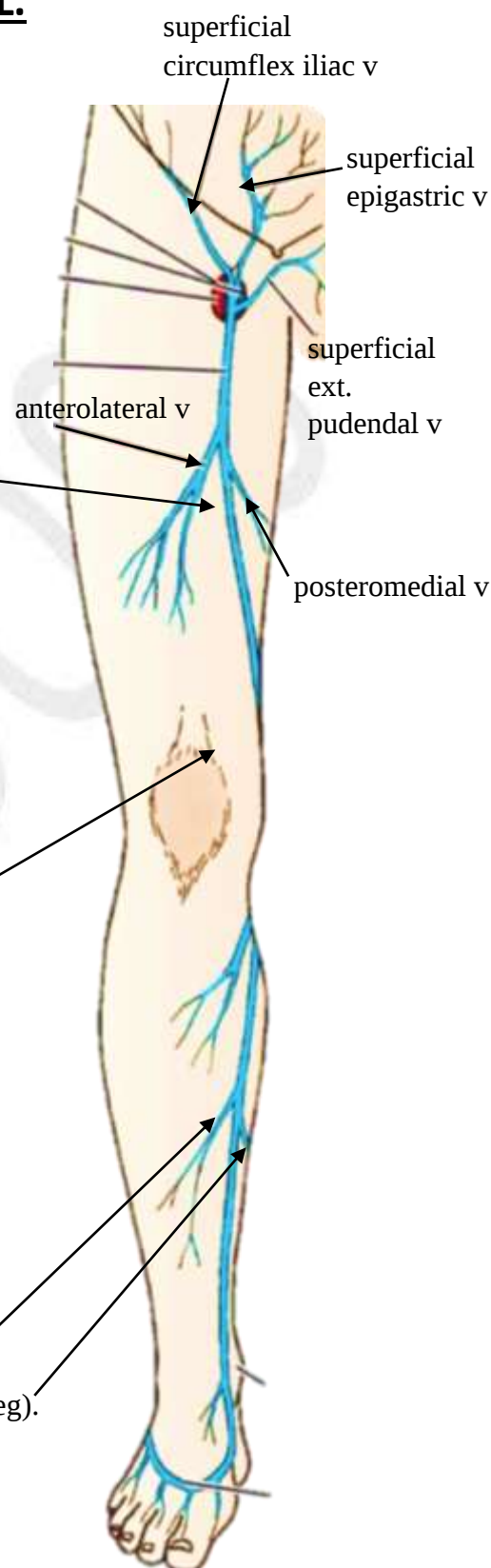
- (1) Below knee:
- (a) ant. vein of leg (crosses the shin of tibia).
 - (b) post. arch v. (in the posteromed. aspect of leg).

- (2) Above knee:
- (a) anterolateral v. of thigh.
 - (b) posteromedial v. of thigh.

- (3) At the inguinal region:
- (a) superficial epigastric v.
 - (b) superficial circumflex iliac v.
 - (c) superficial ext. pudendal v.
 - (d) superficial dorsal vein of penis.

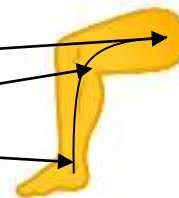
(4) Tributaries connecting it with small saphenous v.

(5) perforating veins connecting it with the deep veins of the leg & thigh.



* **Surface anatomy:** represented by a line connecting the following points:

- 1- a point 4 cm below & lat. to the pubic tubercle
- 2- a point just behind the adductor tubercle of femur
- 3- a point just in front of the medial malleolus of tibia



3- Small (short) saphenous V.

* **Begins** on the lat. side of dorsum of foot as continuation of the lat. end of the dorsal venous arch

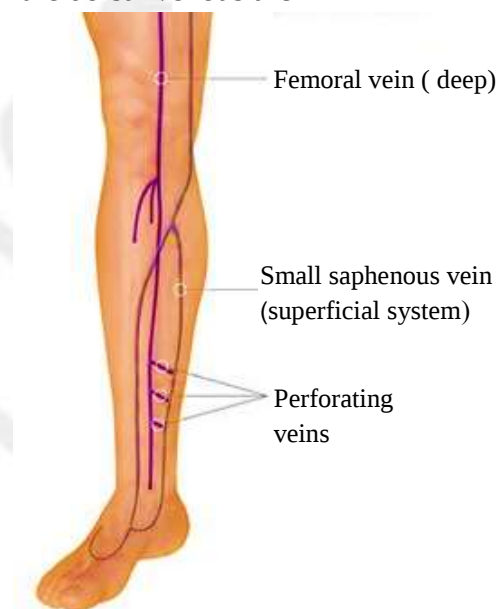
* **Course:**

- 1- it curves below & behind the lat.malleolus .
- 2- it ascends on the back of leg lat.to tendocalcaneus then ascends superficial to gastrocnemius accompanied by the sural n
- 3- one inch below the knee it pierces the deep fascia roofing popliteal fossa

* **Termination:** it passes between the 2 heads of gastrocnemius to end in the popliteal V

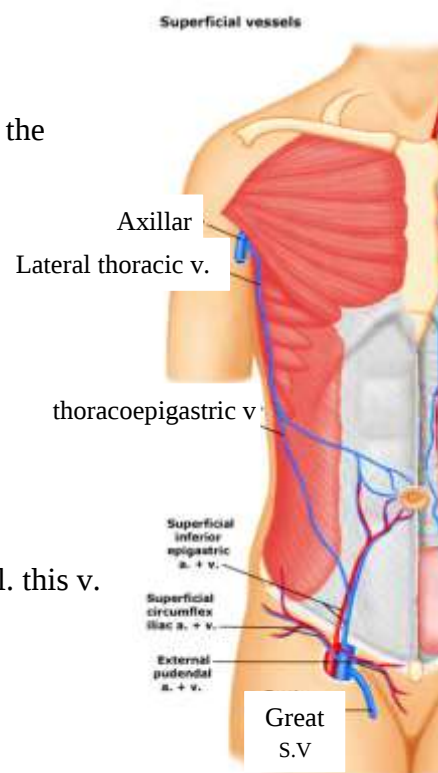
* **communications & Tributaries:**

- 1- communication with soleal venous plexus via perforating veins
- 2- communication with the great saphenous veins
- 3- unnamed tributaries from the foot & leg



Applied Anatomy

- (1) The venous blood from the low pressure superficial veins (great & small saphenous vein) goes to the high pressure deep veins (femoral , popliteal & tibial vv.) via perforating veins provided with valves directing the blood towards the deep veins.
- (2) **Varicose veins** (abnormal dilatation & tortuosity of the superficial veins of L.L): result from abnormal flow of blood from the deep to the superficial veins due to incompetence of the valves.
- (3) great saphenous V. can be used as **a graft** replacing obstructed arteries e.g. coronary arteries of heart.
- (4) **Venipuncture** : can be done in the **great** saphenous v. in front of med. malleolus (constant position) for injection of solutions or blood transfusion.
- (5) the superficial epigastric V.(tributary of great saphenous v. is connected to the lat. thoracic v. (tributary of axillary v.) via thoracoepigastric v. which runs in the superficial fascia of ant.abd.wall. this v. allows collateral circulation in case of obstruction of I.V.C.



II-Deep veins of the L.L.

(1) Venae comitantes of ant.& post. tibial a :

- * each of the ant.& post .tibial a. is accompanied by 2 venae comitantes
- * these venae comitantes ascend towards the knee& unite at the lower border of popliteus muscle to form the popliteal vein.

(2) The popliteal vein:

- * **Begins** at the lower border of popliteus m.by the union of the venae comitantes of the ant. & post. tibial arteries.

- * **Course & relations:** (see page 58)

- at its beginning , it lies med. than ascends behind the artery to end posterolateral to the artery at the adductor hiatus.
- the tibial n. Lies superficial to the vein being posteromed. to the n. in the lower part & posterolat. to it in the upper part.

- * **Ends:** by passing through the adductor hiatus to continue as the femoral V.

- * **Tributaries**

- (1) short saphenous v. : Joint the popliteal V.at the middle of popliteal fossa.
- (2) the 5 genicular veins accompanying the branches of the popliteal artery.

(3) Femoral Vein:

- * **Begins:** at the adductor hiatus as a continuation of popliteal V.

- * **Course & relations**

- (1) its lower ½ :lies in the subsartorial canal being posterolateral to femoral a.at the lower end & post. to the a. at the upper end.
- (2) its upper ½ : lies in the femoral triangle becoming med. to the artery at the upper part.

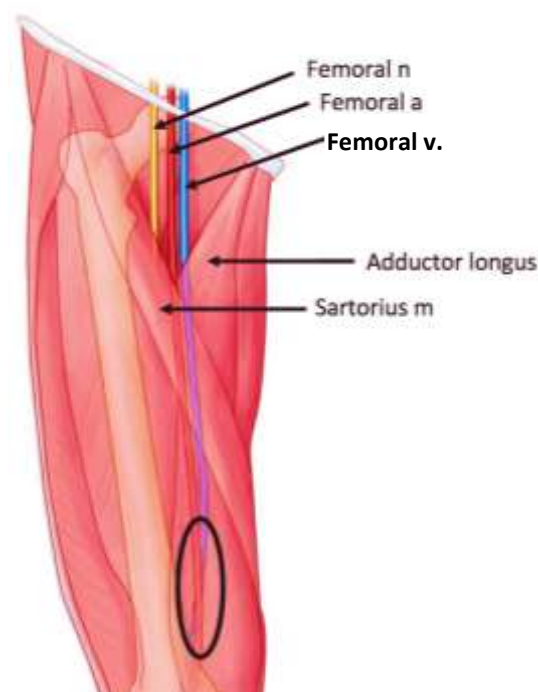
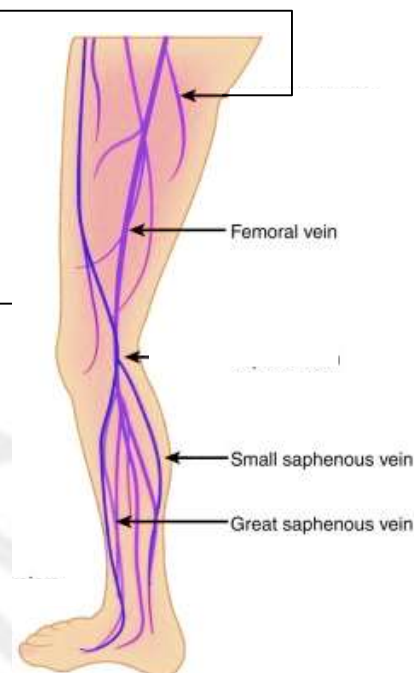
N.B: its upper most 4 cm of the Y.lies in the intermediate compartment of the femoral sheath, with the femoral canal med. to it

- * **Ends:** by passing behind the inguinal lig.to continue as the external iliac V.in the abdomen.

- * **Tributaries:**

- (1) Long saphenous vein.
- (2) Profunda femoris vein.
- (3) deep external pudendal vein.
- (4) med. circumflex femoral v.
- (5) lat. circumflex femoral v.

They accompany their arteries & end in the femoral vein instead of the profunda



lymphatic drainage of the L.L.

(A) **Superficial lymphatics** (drain the skin & subcutaneous tissue) :

- the majority of vessels follow the great saphenous V. to end in the superficial inguinal L.Ns.
- few lymphatics (from lower part of leg) follow the short saphenous V. to end in the popliteal L.Ns

(B) **Deep lymphatics** (drain structures beneath the deep fascia) :

- they are less numerous than the superficial lymphatics.
- they accompany the arteries (ant. & post. tibial , popliteal & femoral).
- they end in the popliteal & deep inguinal L.Ns.

Lymph Nodes of L.L.

I- Superficial inguinal L.Ns :

- * **Site** : in the superficial fascia of the roof of the femoral triangle.
- * **groups** : they are arranged in 2 groups (vertical & horizontal).

(1) **the vertical group** (homologous to lat. axillary group) :

- lie along lat. side of the upper end of the great saphenous V.
- it drains almost all superficial structure of the L.L.

(2) **Horizontal group** : formed of 2 sets :

- (a) med. set (homologous to the pectoral group of axillary L.Ns):
 - it lies below the med. part of the inguinal lig.
 - it drains the ant. abdominal wall below umbilicus (including genitalia).
- (b) lat. set (homologous to the scapular group of axillary L.Ns) :
 - it lies below the lat. part of the inguinal lig.
 - it drains the back of the trunk below the iliac crest.

* **Efferent lymphatics** from all the above-mentioned L.Ns pierce the cribriform fascia to drain into the deep inguinal L.Ns .

II - **Deep inguinal L.Ns** : (homologous to apical axillary L.Ns) :

- **site**: lie along the med. side of the femoral V.
- **receive afferent** lymphatics from:
 - (2) all deep structures of the L.L.
 - (3) efferent lymphatics from the popliteal L.Ns.
- **send efferent** lymphatics to the external iliac L.Ns in the abdomen.

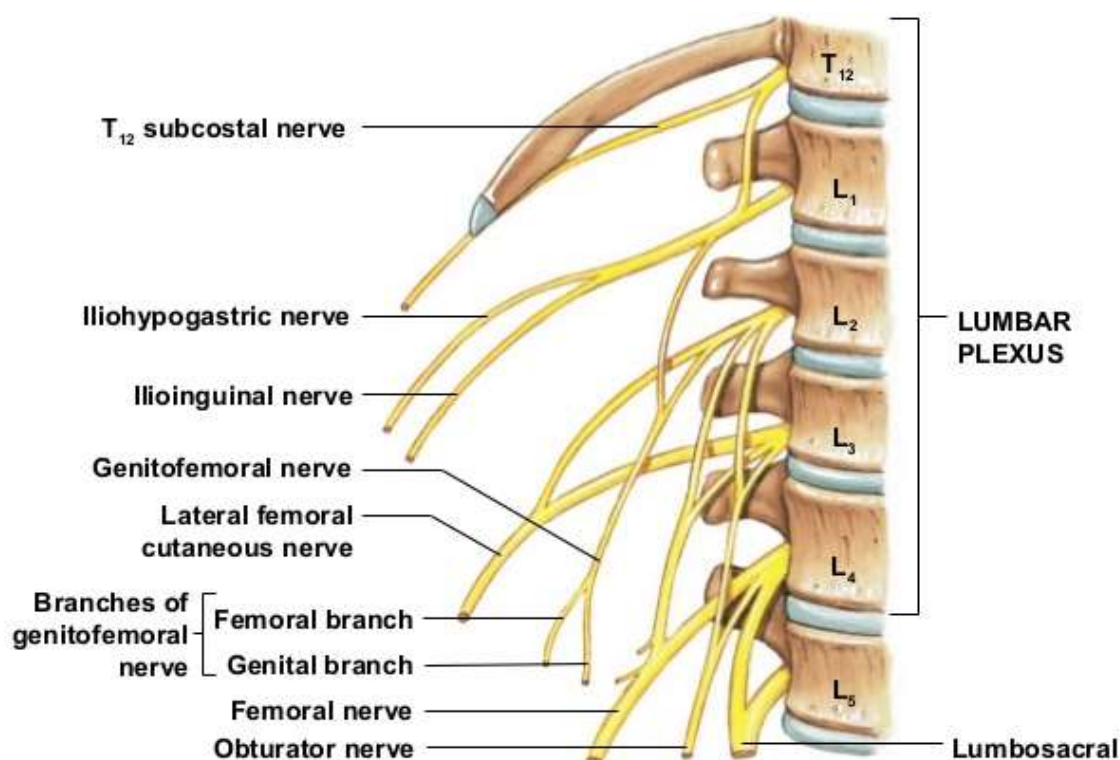
III- Popliteal L.Ns:

- they lie along the popliteal vessels beneath the deep fascia in the popliteal fossa.
- they receive afferent lymphatics passing alongside short saphenous V. & tibial vessels.
- they send efferent lymphatics to the deep inguinal L.Ns.



NERVES OF THE LOWER LIMB

1- Lumbar plexus



* **Site** : it lies inside the post. part of the substance of psoas major m. in the abdomen.

* **Formation** : by the ant. 1ry rami of the upper 4 lumbar nerves (L1, 2, 3, 4). Each of which (except L1) divides into ant. (ventral) & post. (dorsal) divisions.

* **Branches of the plexus :**

large branches	small branches	Distribution of the roots of the plexus
(1) Femoral n. from post divisions of L2, 3, 4.	(3) iliohypogastric (L1)	L1 gives iliohypogastric n. ilioinguinal n 1st root of genitofemoral n
(2) Obturator n. from ant. divisions of L2, 3, 4. small branches	(4) ilioinguinal (L1)	
	(5) genitofemoral (L1 , 2)	
	(6) lat. cut n. of thigh (post. divisions of L2, 3)	L2 gives 2nd root of genitofemoral n 1st root of lat.cut.n. of thigh 1st root of obturator n 1st root of femoral n
		L3 gives 2st root of lat.cut.n. of thigh 2rd root of obturator n 2nd root of femoral n
(7) Accessory obturator n. is frequently present and arise from the ventral divisions of L3 & .L4		L3 gives 3rd root of obturator n 3rd root of femoral n upper root of lumbosacral trunk

*** Exit of the branches from the psoas major muscle:**

- | | | |
|----------------------------|---------|---|
| (1) obturator n |] ————— | emerge from the medial border of psoas major |
| (2) accessory obturator n | | |
| (3) lumbosacral trunk. | | |
| (4) iliohypogastric n. |] ————— | emerge from the lat. border of psoas major |
| (5) ilioinguinal nerve. | | |
| (6) lat. cut. n. of thigh. | | |
| (7) femoral nerve . | | |
| (8) Genitofemoral nerve: | | emerges from the ant. surface of psoas major. |

Individual branches of lumbar plexus

(1) Iliohypogastric n. (L1):

- for details of its course : see abdomen.
- it divides into :
 - (a) lat. cutaneous br. : supplies posterolat. aspect of buttock.
 - (b) ant. cutaneous br. : supplies skin of the abd.above the pubis.

(2) Ilioinguinal n. (L1) :

- for details of its course : see abdomen.
- it emerges through the superficial inguinal ring to supply skin of upper part of the external genitalia.

(3) lateral cut.n. of thigh (dorsal divisions of L2 ,3) :

- emerge from the lat. border of psoas.
- descends downwards & laterally on iliacus m. towards the ASIS.
- it enters the thigh by passing behind the lat.end of the inguinal lig.
- it ends by dividing into ant.& post. terminal branches
 - (a) the ant.br. : supplies the skin of lat. aspect of thigh down to knee.
 - (b) the post. br. : supplies the skin of lat. aspect of thigh till its middle

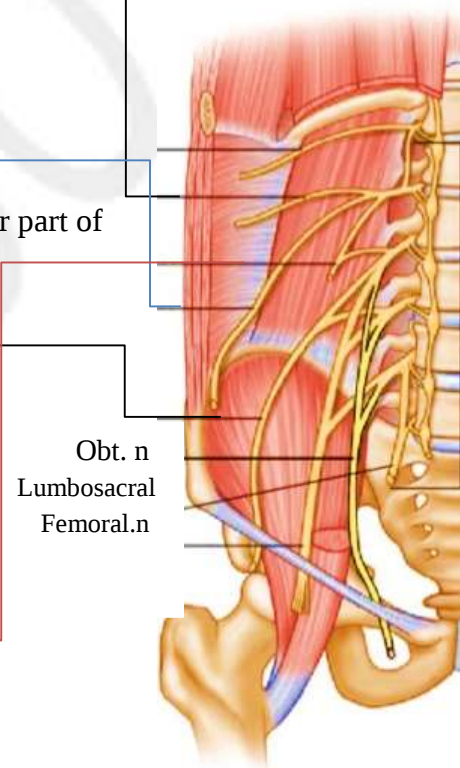
(4) Genitofemoral n. (L1, 2) :

- it emerges from the ant. surface of psoas major m.
- it descends in front of the muscle towards the inguinal lig.
- it ends shortly above the inguinal lig.
 - (a) Genital br. : supplies the skin of the external genitalia + cremasteric m.
 - (b) Femoral br : descends in front of the femoral a. in the lat. compartment of the femoral sheath then pierces the lat. wall of the sheath to supply the skin of the upper part of the femoral triangular .

(5) Lumbosacral trunk :

- it is formed by br.from L4 + the 5th lumbar n.
- it emerges from med. side of psoas & descends to the pelvis to share in the sacral plexus.

N.B: the 4th lumbar n. is a link between the lumbar & sacral plexuses so it is named Nerves furcalis (forked nerve).



Obturator nerve

* It is the nerve of the med.(adductor) compartment of the thigh.

* **Origin:** from the ventral division of L2,3,4

* **Course & relations:**

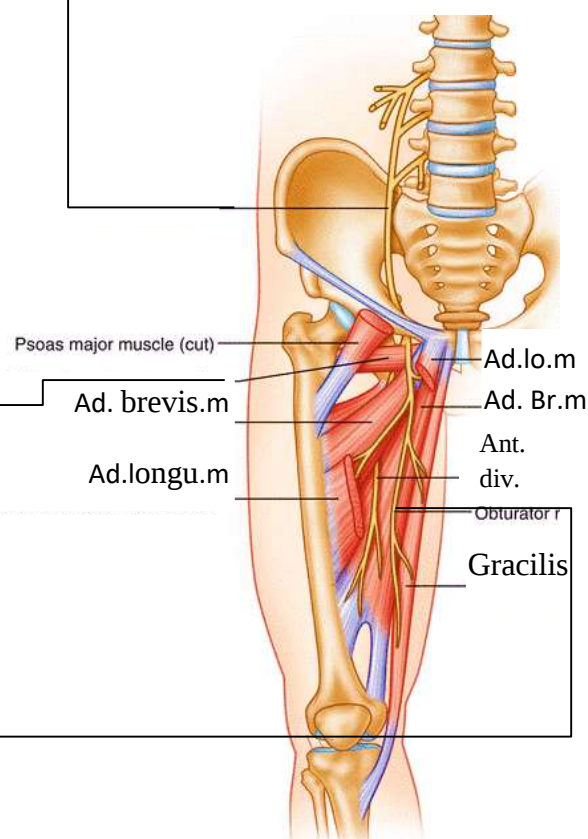
- 1- it emerges from the med. side of psoas major m.
- 2- it runs downwards & forwards on the side wall of the pelvis to reach the upper part of obturator foramen (obturator canal)
- 3- while in the canal , it divides into ant. & post. divisions :

(A) the anterior division :

- passes above the upper border of obturator externus m.
- it runs downwards in front of adductor brevis muscle (behind pectineus & add. longus muscles)
- it gives the following branches :
 - (1) muscular : to add. longus , add.brevis & gracilis.
 - (2) cutaneous : to lower part of anteromed. aspect of thigh.
 - (3) articular br. : to the hip joint, and terminates as a small nerve that supplies femoral a.*

(B) the posterior division :

- pierces the upper part of the obturator externus m.
- it descends behind the add. brevis m. & in front of add. Magnus.
- it gives the following branches :
 - (1) muscular to : add.brevis ,pubic part of add. magnus & obturator externus.
 - (2) articular to knee joint, . By descending through the add. Hiatus to supply the knee joint. *



N.B : the cutaneous br. of the ant. division joins the subsartorial plexus of nerves.

Accessory obturator nerve

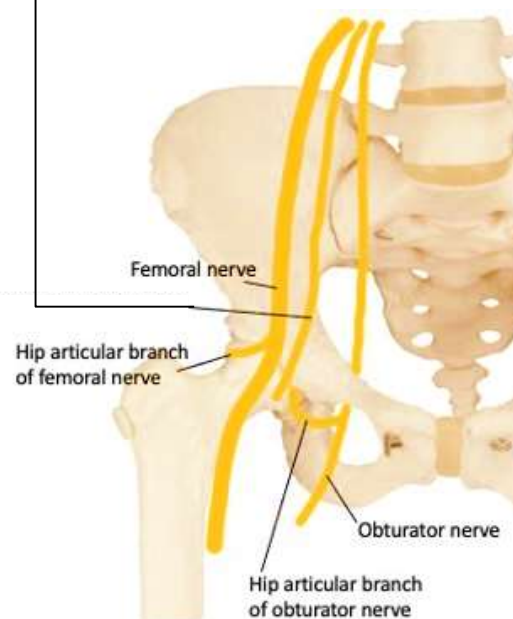
- it is present in 30% only of people.

* **Origin :** from the ant. divisions of L3, 4.

* **Course & relations :**

- it emerges from the med. side of psoas & descends along its med. border.
- it enters the thigh by crossing in front of sup. pubic ramus & deep to the pectineus m. where it ends by giving :

- (a) muscular br. to pectineus m.
- (b) articular br. to the hip joint.
- (c) communicating br. to the ant. division of obturator n.



Femoral nerve

- * It is the largest br. of the lumbar plexus.
- * it is the nerve of the ant. compartment of thigh.

* **Origin:** from the dorsal divisions of L2, 3, 4.

* Course & relations:

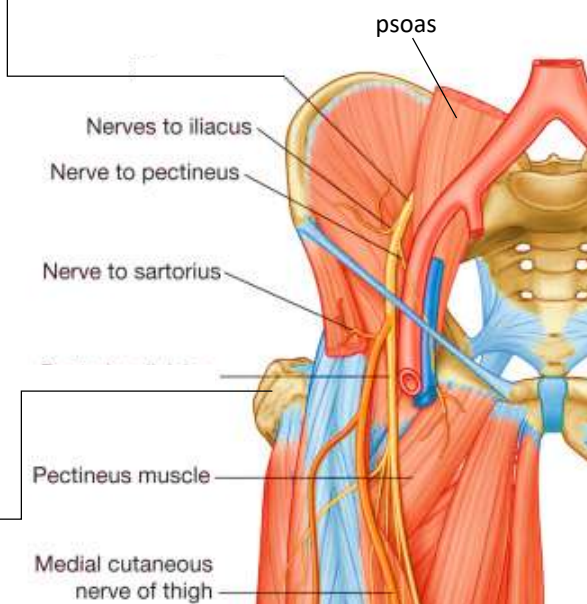
- it emerges from lower part of lat. border of psoas major.
- it descends in the groove between psoas & iliacus m.(behind the iliac fascia of the post. abdominal wall).
- it enters the thigh by passing behind the inguinal ligament lat. to the femoral artery but outside the femoral sheath.
- one inch below the inguinal lig. it ends by breaking into branches which are divided into ant. & post. groups by lat. circumflex F.a.

- **The anterior group of branches** include:

- (a) muscular brs. to sartorius m.
- (b) cutaneous brs. - med. cut.n. of thigh.
- intermediate cut. n. of thigh.

- **The posterior group of branches** include :

- (a) muscular to (1) pectineus. (2) quadriceps (3vasti+ rectus femoris).
- (b) cutaneous br. : saphenous n.
- (c) articular brs. : (1) articular br. to hip joint(from the n. to rectus femoris).
(2) articular br. to knee joint(from brs. to quadriceps m.).



Comment on the branches of the femoral n.

I - Motor brs. of the femoral n.

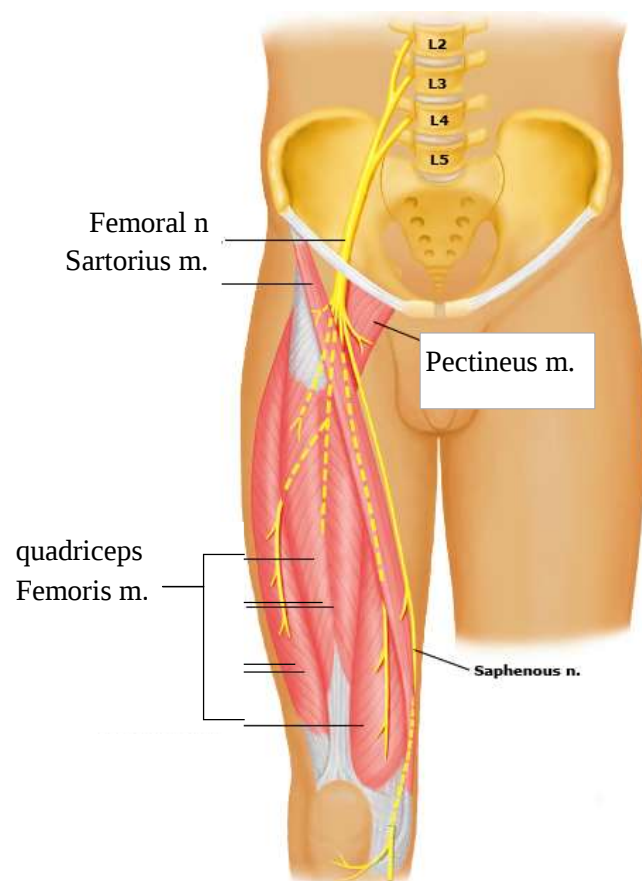
- (1) br. to iliacus m.(before femoral n. enters the thigh).
- (2) br. to pectineus m.(arises from med. side of femoral n. just above the inguinal lig. & passes behind femoral sheath to supply the front of pectenus).
- (3) 1-2 brs. to sartorius(from the ant. group brs.).
- (4) 1-2 brs. to each head of quadriceps(from post. group of brs.).

- Articular brs. :

- (1) br. to hip joint : supplied by the n. to rectus femoris.
- (2) br. to knee joint : supplied by the nerves to the 3vasti.

N.B : n. to vastus medialis contains the maximum proprioceptive fibers to the knee joint (this accounts for its large size).

II - Vascular brs. : to femoral a. & its branches.



V - Cutaneous brs. of the femoral n.:

(1) Intermediate cut. n. of thigh:

- it is one of the ant. division brs. of the femoral n
- it pierces the deep fascia at the junction of upper $\frac{1}{3}$ & middle $\frac{1}{3}$ of the thigh.
- it supplies the skin of the intermediate area of front of thigh.

(2) Medial cutaneous n. of thigh:

- it is one of the ant. division brs. of the femoral n.
- it lies first lat. to the femoral a. then crosses to the front of the artery near the apex of the femoral $\blacktriangle$.
- it divides into ant. & post.brs.(in relation to the great saphenous v.) which pierce the deep fascia of the thigh about its middle.
- it shares in the subsartorial plexus of nerves & supplies the skin of med. side of the thigh.

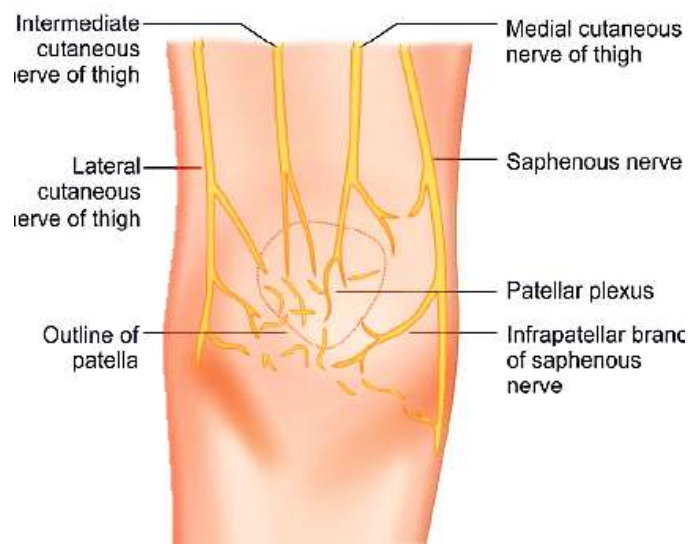
(3) Saphenous nerve : (the lonest n. in the body):

- it is one of the post. divion branches of the femoral n.
- it lies lat. to femoral a. in the femoral $\blacktriangle$ then crosses to its med. side in the subsartorial canal.
- it leaves the subsartorial canal by piercing the deep fascia on the med. side of the knee between the tendons of sartorius & gracilis muscles
- it descends on the med. side of leg in front of the great saphenous vein down to the front of med. malleolus then runs along the med. border of foot till the M.P joint of the big toe.
- Branches of saphenous never :
 - (1) br. to subsartorial plexus.
 - (2) infrapatellar br. to the patellar plexus.
 - (3) cut.brs. to med. side of leg & med. border of foot



Patellar plexus of nerves

- it is a small nerve plexus lying over the patella & patellar lig.
- it is formed by the following nerves :
 - (1) ant.branch of the lateral cutaneous n. of thigh.
 - (2) the intermediate cutaneous nerve of thigh.
 - (3) the ant.branch of the medial cutaneous n. of thigh.
 - (4) the infrapatellar branch of the saphenous nerve.

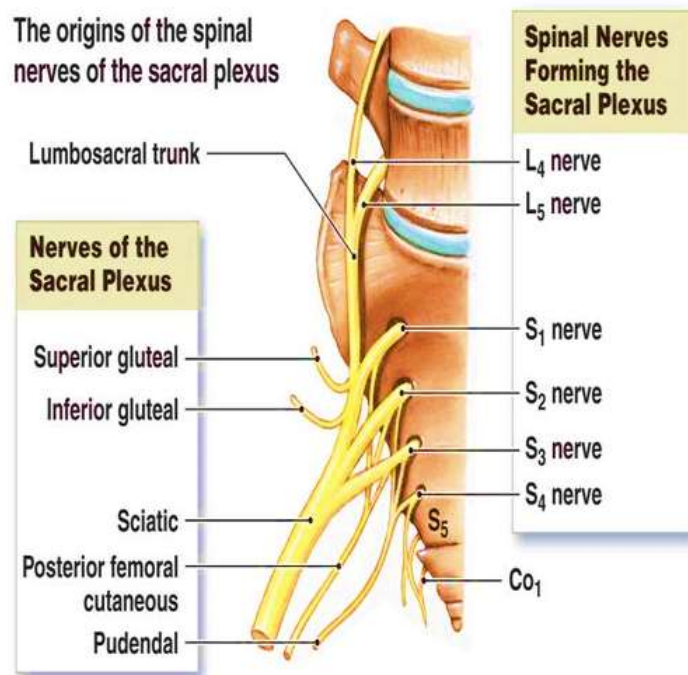


Sacral plexus

- * It is the nerve plexus concerned with the supply of:
 - (a) muscles of gluteal region, back of thigh & all muscles of the leg & foot.
 - (b) Skin of back of thigh & all skin of the leg & foot except the med. side.

* **Formation:** it is formed of the lumbosacral trunk (L4, 5) & the ventral rami of S1, 2, 3 & the upper part of S4. Each of these nerve roots divides into ant. & post. divisions.

* **Site & Relations:** - it lies on the post. pelvic wall in front of piriformis m. & behind the internal iliac vessels, ureter, sigmoid colon (on Lt. side) & terminal part of the ileum (on the Rt. side).



- the roots converge towards the lower part of the greater sciatic foramen. Where they unite forming a triangular band which ends by dividing into :
 - (a) a large upper terminal band (sciatic n.).
 - (b) a small lower terminal band (pudendal n.).

* Branches of the plexus:

(A) Branches from the roots : (5Ps):

- (1) n. to Piriformis (S1, 2)
- (2) Perforating cut. n. of thigh (S2, 3).
- (3) Pelvic splanchnic n. (parasymp.): S2,3,4
- (4) Perineal br. of 4th sacral n.
- (5) Pudendal n. (S2,3,4).

(B) Branches from post. divisions :

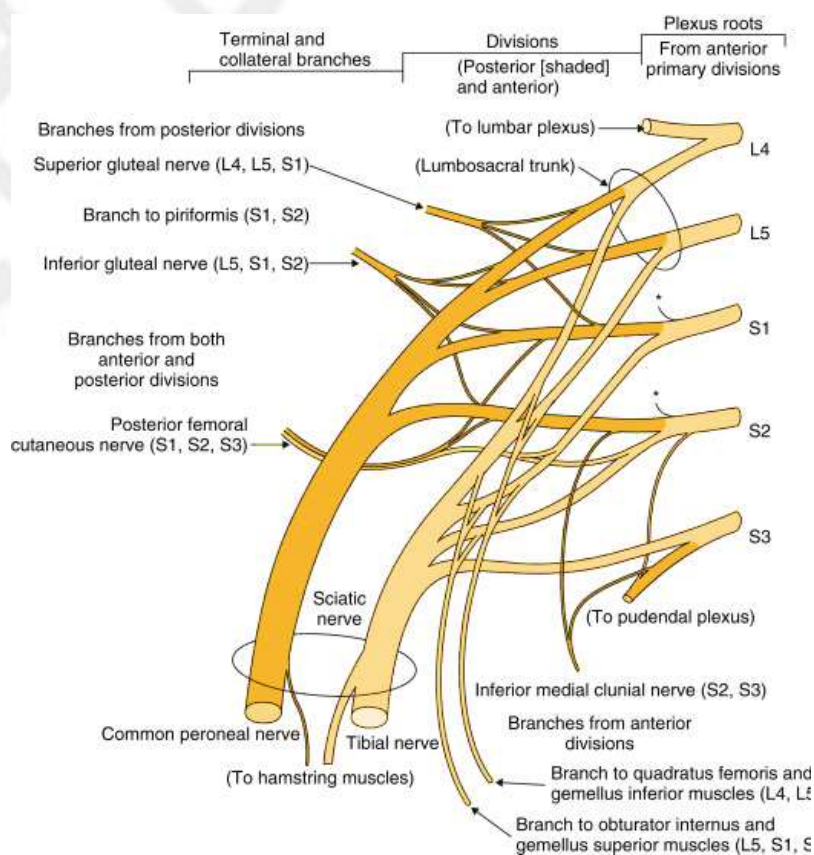
- (1) sup. gluteal nerve (L4,5,S1).
- (2) inf. gluteal nerve (L5,S1,2).

(C) Branches from ant. divisions :

- (1) n. to quadratus femoris (L4,5,S1).
- (2) n. to obturator internus (L5,S1,2).

(D) Branches from both ant. & post. divisions :-

- (1) Sciatic n. :
 - - com. peroneal part (post. division of L4,5,S1,
 - - tibial part (ant. division of L4,5, S1,2,3).
- (2) post. cut. n. of thigh (post. divisions of S1,2 & ant. div. of S2,3).



Comment on the important branches of the sacral plexus

(1) **perforating cut.n. of thigh(S2,3)** : perforates the sacrotuberous lig. & winds round the lower border of gluteus maximus to supply the skin on its lower med. part.

(2) **post.cutaneous n. of thigh (S1,2,3)** :

- leaves the pelvis through greater sciatic foramen below piriformis.
- it descends on the dorsal surface of sciatic n. , covered superficially by gluteus maximus m. at the origin of hamstrings , it leaves the sciatic n. by passing superficial to the long head of biceps m. then continues along middle line of the back of thigh just beneath the deep fascia.
- it pierces the deep fascia of the roof of the popliteal fossa to accompany the short saphenous vein to middle of the calf where it ends.
- it gives the following **branches** :
 - (a) gluteal brs. to supply the skin over inferolateral part of gluteus maximus
 - (b) perineal brs. to supply the skin of the perineum.
 - (c) brs. to the skin of back of thigh , popliteal fossa & upper ½ of the back of leg.

(3) **N.to quadratus femoris** (from ant. divisions of L4,5,S1):

- leaves the pelvis through greater sciatic foramen below piriformis m.
- descends on the back of ischium deep to sciatic n. , obturator internus tendon & the 2 gemelli.
- it ends by supplying the quadratus femoris (through its ant. surface)+inf. gemellus & hip joint.

(4) **N. to obturator internus** (from ant. divisions of L5,S1,2) :

- leaves the pelvis through greater sciatic foramen below piriformis.
- it gives br. to sup. gemellus, then crosses the ischial spine lat. to internal pudendal a.
- it re-enters the pelvis through lesser sciatic foramen to supply the obturator internus m.

(5) **Sup. gluteal n.** (L4,5,S1):

- leaves the pelvis through greater sciatic foramen above the piriformis m.
- it passes forwards between gluteus medius & gluteus minimus (accompanied by the deep br. of the sup. gluteal a.) then it divides into 2 branches (upper & lower):
- (a)the upper br. supplies gluteal medius (b)the lower br. supplies glut. minimus + tensor fasciae latae.

(6) **Inf. gluteal n.** (L5,S1,2):

- leaves the pelvis through greater sciatic foramen below piriformis m.
- it enters the deep surface of gluteus maximus m. to supply it.

(7) **Pelvic splanchnic n.**(parasympathetic, from S2,3,4): to pelvic viscera. *

(8) **Pudendal n.**(from the roots S2,3,4):

- leaves the pelvis through greater sciatic foramen below piriformis m.
- crosses the back of the sacrospinous lig. to enter the lesser sciatic foramen.
- its detailed course is described in the pelvis.

(9) **Sciatic N.** : see next page

Sciatic nerve

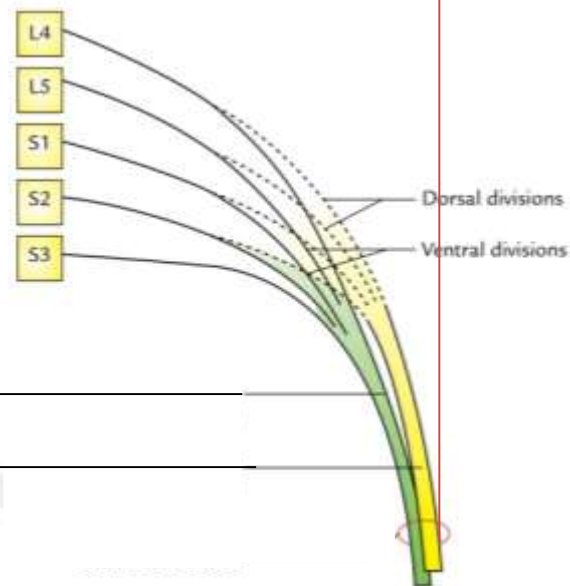
* It is the thickest n. in the body (2cm in diameter at its beginning).

* **Origin** : inside the pelvis as the largest br. of the sacral plexus.

* **Components** : the sciatic n. is formed of 2 parts having a common sheath.

(1) tibial (med .popliteal)part : from ant. divisions of L4,5 & S1,2,3.

(2) common peroneal (lat .popliteal)part : from post. divisions of L4,5 & S1,2.



N.B: (1) the sciatic n. is flat near its origin but become rounded distally

(2) the sciatic n. is accompanied by an artery called companion a. of sciatic n.(a br. of inf. gluteal a.).

* **Variations** : the sciatic n. may be absent . In such case its 2 components arise directly from the sacral plexus & leave the pelvis as follows: (a) the tibial (med. popliteal) n. passes below the piriformis.
(b) the common peroneal(lat. popliteal) n. : pierces the piriformis.

* **Course** :

- (1) it leaves the pelvis through the lower part of greater sciatic foramen below piriformis to reach the gluteal region.
- (2) in the gluteal region, it runs on the back of ischium downwards to a point midway between the ischial tuberosity & greater trochanter.
- (3) then it runs vertically downwards along the middle line of back of thigh.

* **Termination** : at the sup. angle of the popliteal fossa by dividing into the tibial & common peroneal nerves.

* **Relations:**

I - Deep Relations : (from above downwards):

- (1) back of ischium (with n. to quadratus femoris inbetween).
- (2) the tendon of obturator internus & 2 gemelli.
- (3) quadratus femoris muscle (separating it from obturator externus m. & the hip joint).
- (4) post. surface of adductor magnus muscle.

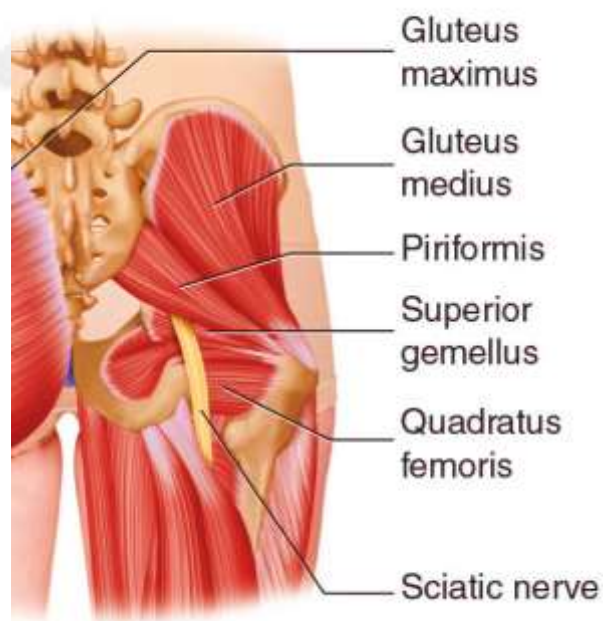
II - Superficial Relations

- (1) in the gluteal region : it is covered by gluteus maximus.
- (2) in the back of thigh : it is crossed by long head of biceps.

III - Laterally : biceps femoris.

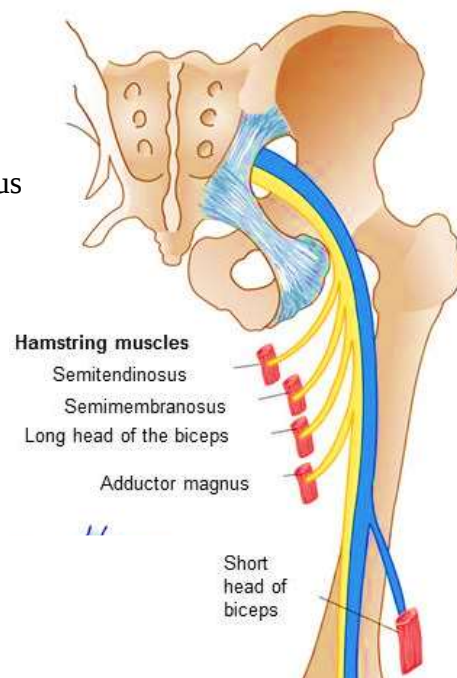
IV - Medially : - post. cut. n. of thigh.

- semimembranosus & semitendinosus muscle.



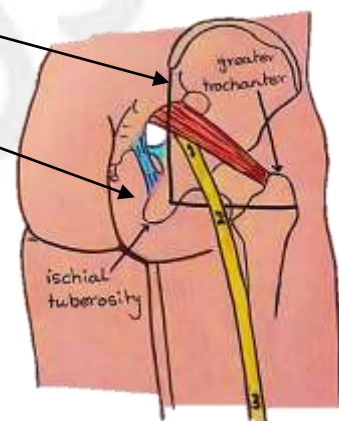
* Branches of sciatic n.

- (1) Articular brs.: to the hip joint
- (2) Muscular brs. :
 - (a) from its medial side (tibial part) to :
 - ischial head of add.magnus
 - semitendinosus
 - Semimembranosus
 - long head of biceps
 - (b) from its lat.side (common peroneal part) to : short head of biceps.
- (3) Terminal brs.:
 - tibial nerve.
 - - common peroneal nerve.



* Surface anatomy: it is marked by a line joining the following 3 point

- (1) a point 1" lat.to the midpoint between post.sup.ilic spine & the ischial tuberosity.
- (2) a point just medial to the midpoint between ischial tuberosity & the greater trochanter.
- (3) a third point in the middle line of back of thigh at the junction between the upper $\frac{2}{3}$ & the lower $\frac{1}{3}$.



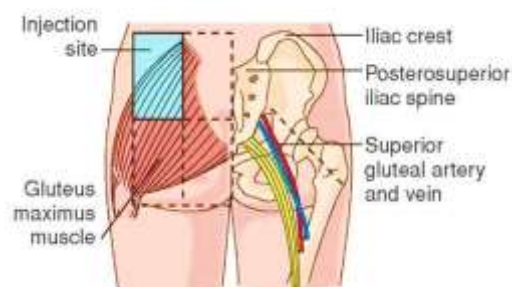
Injury of sciatic nerve

I - In the gluteal region (above the branches to hamstring muscles):

- * Causes:
- (1) post. dislocation of hip joint.
 - (2) wrong intramuscular injection (in the lower med. quadrant of gluteal region).
 - (3) penetrating wounds.

* Effects :

- (A) Motor: paralysis of
 - hamstring muscles.
 - ischial part of add.magnus.
 - all muscles of leg & foot.
- (B) Sensory: loss of sensation from the leg & foot except the med.side which is supplied by the saphenous n. (br.of femoral n.)
- (C) Deformity : foot drop.



II - In the back of thigh (below the branches to hamstring muscles):

* Effects :

- (A) Motor : like injury in gluteal region but hamstrings are intact.
- (B) Sensory : like injury in the gluteal region.
- (C) Deformity : like injury in the gluteal region.

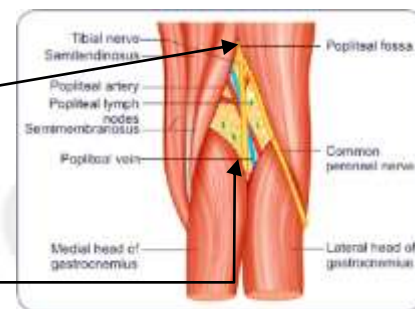
Tibial (med. popliteal) nerve

* **Root value** : from ventral divisions of L4,5 & S1 ,2 ,3.

* **Origin** : arises as the larger of 2 terminal branches of the sciatic n. at the junction of the upper $\frac{2}{3}$ & lower $\frac{1}{3}$ of the back of thigh.

* **Course** :

- (1) it enters the popliteal fossa through its upper angle.
- (2) it descends vertically in the middle line of the fossa bisecting it longitudinally , being the most superficial structure (post. to the vessels).
- (3) it leaves the fossa at its lower angle , between the 2 heads of gastrocnemius.



* **Termination** : at the lower border of popliteus m. by becoming the post. tibial n. which enters the back of the leg.

* **Relations:**

(1) skin ,fascia & hamstrings (in the upper part)

(A) Superficially(posteriorly) : (2)skin ,fascia & pad of fat (in the middle part).

(3)skin ,fascia & gastrocnemius (in the lower part).

(B) Deeply (anteriorly) : popliteal vessels, separating the nerve from:

- (1) popliteal surface of femur.
- (2) back of knee joint
- (3) fascia covering the popliteus m.

N.B : the tibial n. has tripple relation with the popliteal vessels.

(a) in the upper part of the fossa : it lies posterolat. to the vessels.

(b) in the middle part of the fossa : it lies posteroir to the vessels.

(c) in the lower part of the fossa : it lies posteromed. to the vessels.

(C) Laterally: -long head of biceps & common peroneal n.(above).

-lat. head of gastrocnemius & plantaris m.(below).

(D) Medially: semimembranosus & semitendinosus muscle(above)

-med. head of gastrocnemius muscle (below).

* **Branches:** (1) Muscular to G.P.P.S. :

- Gastrocnemius
- Plantaris
- popliteus.
- soleus.

(2) Articular brs. to the knee joint :.

- Sup. med. genicular
- middle genicular n
- inf. med. genicular.

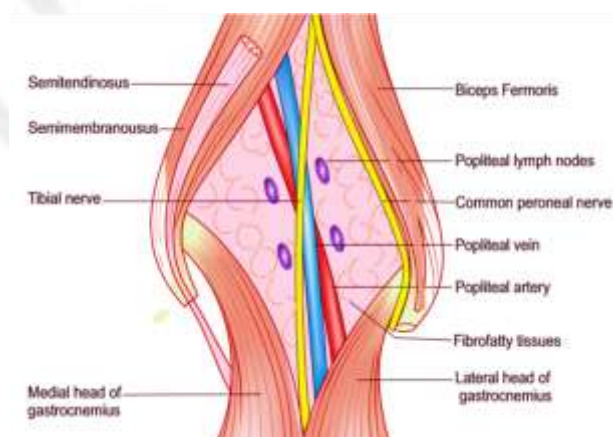
(3) Cutaneous : the Sural n. :

- descends on the back of calf in the groove between the 2 heads of gastrocn.

- about the middle of the calf , it is joined by the sural communicating n. (br. of common peroneal n.)& pierces the deep fascia.

- it passes with the small saphenous v. behind & below the lat. malleolus then along the lat.border of foot.

- it supplies : (a)posterolat. aspect of lower $\frac{1}{3}$ of leg . (b) the lat. border of the foot.



Posterior tibial n.

* **Origin** : it begins as a continuation of the tibial n. at the lower border of the popliteus muscle.

* **Course** :

- (1) it descends deep to the tedious arch between tibia & fibula to enter the back of the leg.
- (2) it runs in the post. compartment of the leg between the superficial & deep group of muscles.
- (3) in the lower end of the leg , it passes behind & below the med. malleolus, deep to the flexor retinaculum.

* **Termination** : it ends deep to the flexor retinaculum behind med. malleolus by dividing into med. & lat. plantar n.

* **Relations** :

(A) Superficial (post.) relations :

- in the upper $\frac{2}{3}$ it is covered by gastrocnemius & soleus.
- in the lower $\frac{1}{3}$ it is covered by skin & fascia.

(B) Deep(ant.) relations : - in the upper $\frac{2}{3}$: it lies on tibialis posterior muscle.

- in the lower $\frac{1}{3}$: it lies on the post. surface of tibia.

(C) Medially : flexor digitorum longus muscle.

(D) Laterally : flexor hallucis longus muscle.

(E) Relations to post. tibial a.:

-above: it lies med.to the a -in the middle: it crosses behind the a. -below: it lies lat. to the a.

* **Branches**

I - Muscular : to 3 deep & one superficial m. in the back of leg:

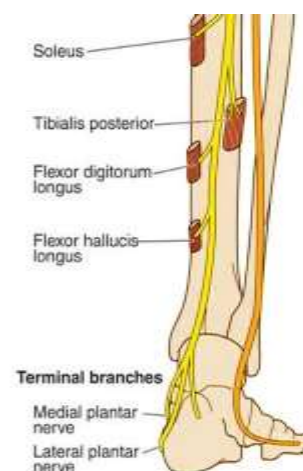
- (1) Soleus m. (by a branch supplying its ant. surface)
- (2) Flex. digit. longus
- (3) flex. hall. longus. (4) Tibialis posterior.

II - Cutaneous : med. calcanean branches which pierce the flexor retinaculum to supply the skin of the heel

III - Articular : to the ankle joint.

IV - Terminal brs. : med.& lat. plantar nerves

(see page 103)



The Medial plantar nerve

- * **Origin** : arises deep to the flexor retinaculum as the larger of the 2 terminal branches of the post. tibial
- * **Course** : it runs forwards in the sole of the foot lat. to the medial plantar a. , between the abductor hallucis & flexor digitorum brevis muscles

* **Branches:**

- I - **Muscular** to 4 muscles : — (1) Abd. Hallucis
 (2) Fl. Hallucis Brevis
 (3) Fl. Digitorum Brevis
 (4) 1st lumbrical m

- II - **Cutaneous** to — - skin of the med. $\frac{2}{3}$ of the sole
 — - skin of the med. $3\frac{1}{2}$ toes

- III - **Articular** : to the intertarsal & tarsometatarsal joints.

N.B: the med. plantar n. in the sole is similar to the median nerve in the hand.



Lateral plantar nerve

- * **Origin:** undercover of the flexor retinaculum as the smaller of the 2 terminal branches of the post.tibial nerve .

- * **Course:** it runs forwards & laterally on the med. side of the lat .plantar a. between the 1st & 2nd layers of the sole in the direction of the base of the 5th metatarsal bone & ends there by dividing into :

- (1) **superficial br.:** divides into 2 planter digital n. and supplies flexor digiti minimi brevis, interossei of the 4th space, and nail beds & tip of toes. *

- (2) **deep br :** turns medially in the concavity of planter arch between the 3rd and 4th layers of the , and supplies: add. Halluces, 2, 3, 4th lumbrical, the rest of interossi*

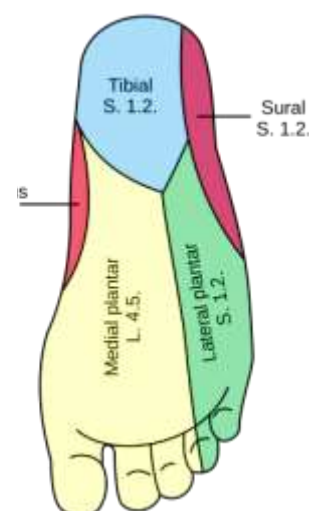
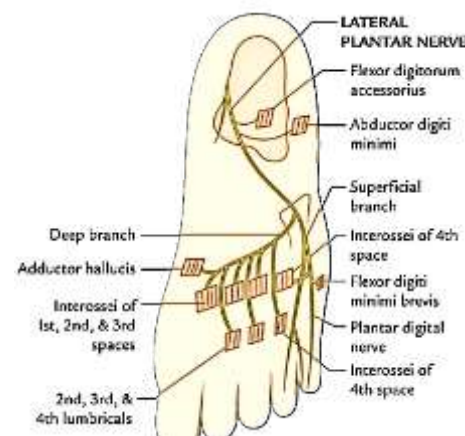
* **Branches :**

- (A) **Muscular brs.to :** — fl. digit. accessorius & abd. Digiti. minimi (from the main trunk).
 — add. hallucis , flex. digiti minimi brevis & lat.3 lumbricals + the 7interossii (from the terminal brs.).

- (B) **Cutaneous** : to skin of lat. $\frac{1}{3}$ of sole & lat. 1 $\frac{1}{2}$ toes

- (C) **Articular** : to the intertarsal & tarsometatarsal joints.

N.B: the lat. plantar n.is similar to the ulnar n. the hand.



Common peroneal (lat. popliteal) nerve

- * **Root value:** dorsal divisions of L4, 5 & S1, 2
- * **Origin:** arises as the smaller of the 2 terminal brs. of the sciatic n.
- at the lower $\frac{1}{3}$ of the back of thigh.

- * **Course & relations:**

- It descends lat. to the tibial n. to enter the popliteal fossa at its upper angle.
- It passes obliquely downwards & laterally in the popliteal fossa along the med. border of biceps femoris muscle.
- It crosses over the plantaris m. & the lat. head of gastrocnemius.
- It leaves the popliteal fossa through its lateral angle.
- It passes behind the head of fibula then winds forwards round its neck deep to peroneus longus muscle.

- * **Termination:** it ends on the lat. side of neck of fibula by dividing into:

- (1) Deep peroneal (anterior tibial) nerve.
- (2) Superficial peroneal (musculocutaneous) nerve.

- * **Branches:**

(I)- **Branches to** short head of biceps.

(II)- **2 cutaneous branches:**

(1) **Sural communicating n.:**

- Arises near the head of fibula & runs downwards on the lat. head of gastrocnemius to join the sural n. (br. of tibial n.): [see page 101](#)

(2) **Lat. cutaneous n. of calf:**

- Arises from the common peroneal n. as it leaves the popliteal fossa.
- It supplies the skin of the upper lat. aspect of the leg.

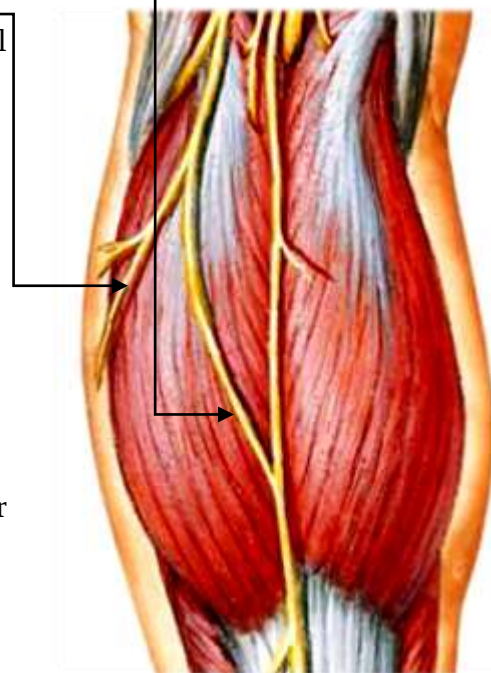
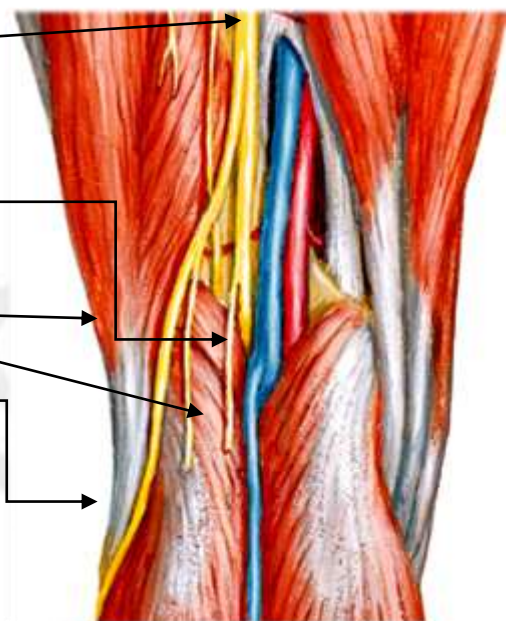
(III)- **3 articular (genicular) brs.:**

- (1) **Sup. Lat. genicular:** runs above the lat. femoral condyle to supply the knee joint.
- (2) **Inf. Lat. genicular:** runs below the lat. tibial condyle to supply the knee joint.
- (3) **Recurrent genicular n. :** arises near the end of the common peroneal n. & ascends with the ant. tibial recurrent a. (through the tibialis ant. Muscle) to supply the knee joint & the sup. tibiofibular joint.

Applied anatomy:

- (1) Common peroneal n. is the only nerve which can be palpated subcutaneously in the L.L. (felt against neck of fibula).

N.B: ulnar n. is the only n. palpated subcutaneously in the U.L.



Anterior tibial (Deep peroneal) nerve

* **Origin:** arises on the lat. aspect of the neck of fibula (undercover of peroneus m.) as one of the 2 terminal branches of the common peroneal nerve.

* **Course:**

- (1) At its origin it lies in the lat. compartment deep to peroneus longus
- (2) It pierces the ant. intermuscular septum to enter the ant. compartment of the leg, passing deep to the uppermost part of ext. digit. longus m.
- (3) It descends vertically on the interosseous memb, company with ant.tibial a.
- (4) Above the ankle, the ant. tibial n. & vessels lie on the lower part of tibia
- (5) Finally, the ant. tibial n. crosses in front of the ankle joint deep to the extensor retinacula.

* **Relations:**

- | | |
|-------------------------------------|--|
| I- <u>In the upper 1/3 of leg</u> | <u>Anteriorly:</u> skin, fascia & extensor muscles
<u>Posteriorly:</u> the interosseous membrane
<u>Medially:</u> tibialis ant. m. + ant. tibial a.
<u>Laterally:</u> ext. digit. longus m. |
| II- <u>In the middle 1/3 of leg</u> | <u>Anteriorly:</u> skin, fascia & extensor muscles
<u>Posteriorly:</u> ant. tibial a.+ the interosseous membrane
<u>Medially:</u> tibialis ant. m.
<u>Laterally:</u> ext. hallucis longus |
| III- <u>In the lower 1/3 of leg</u> | <u>Anteriorly:</u> skin, fascia & ext. hall. longus
<u>Posteriorly:</u> tibial
<u>Medially:</u> ext. hall. longus & ant. tibial a.
<u>Laterally:</u> ext. digitorum Longus |

N.B: the ant. tibial n. has triple relation with ant. tibial a. being lat. to the a. in the upper 1/3 then ant. in the middle 1/3 then returns lat. to the artery again in the lower 1/3 of leg.

* **Termination:** it ends just distal to the inf. Ext. retinaculum by dividing into 2 terminal branches:

Lat.

Med.

* **Branches:**

I- **Muscular:** to 5 muscles

tibialis ant.

ext. digit. longus

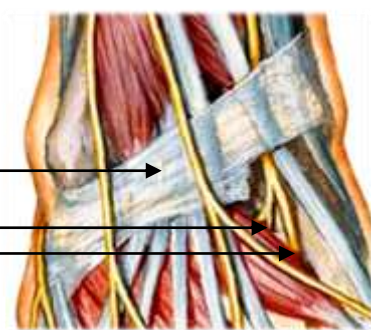
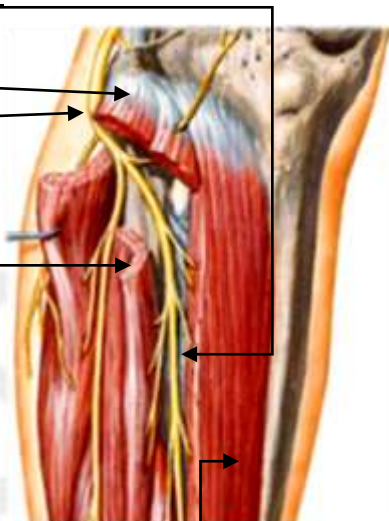
ext. hall. longus

peroneus tertius

ext. digit. brevis: by the med. Terminal br.

By the deep peroneal n. itself

II- **Cutaneous:** to the cleft between 1st & 2nd toes: by the med. terminal br.



III- Articular:

- (1) To the ankle joint (by the deep peroneal n. itself).
- (2) To the tarsal & tarsometatarsal joint (by both terminal branches).

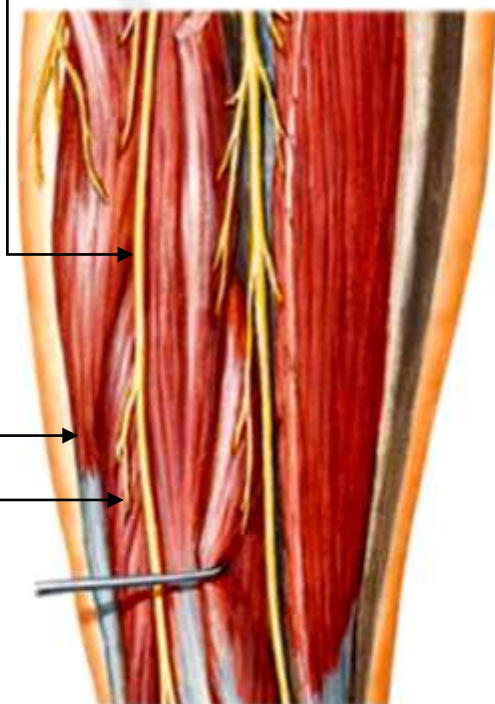
Musculocutaneous nerve

(Superficial peroneal nerve)

* **Origin:** arises as one of the 2 terminal branches of the common peroneal n. on the lat. side of neck of fibula (in the substance of peroneus muscle).

* **Course & relations:**

- (1) At first, it descends in the substance of peroneus longus m.
- (2) Then it descends between the peroneus longus & brevis muscles (supplying both).
- (3) At the **lower** $\frac{1}{3}$ of the leg it emerges between the 2 muscles & pierces the deep fascia to become subcutaneous.
- (4) It descends in the superficial fascia crossing superficial to the sup. & inf. extensor retinacula to reach the dorsum of the foot where it ends by dividing into med. & lat. terminal branches.



– **Branches of the musculocutaneous n.:**

I- **Muscular:** to supply the 2 muscles of the lat. compartment of leg: (a) peroneus longus (b) peroneus brevis.*

II- **Cutaneous:**

- (A) Cutaneous branches from the main trunk: supply the skin of the lower $\frac{2}{3}$ of the anterolateral aspect of the leg.
- (B) The lat. & med. terminal branches: supply the dorsum of the foot & toes except:
 - (1) The lat. border which is supplied by the Sural n.
 - (2) The med. border which is supplied by the Saphenous n.
 - (3) The cleft between the 1st & 2nd toes which is supplied by the ant. tibial n.

* **The medial terminal branch:**

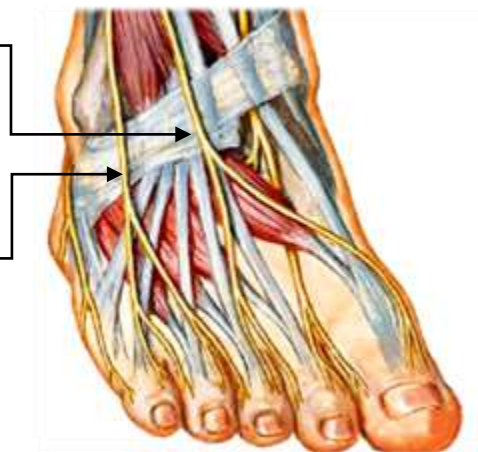
Supplies the skin of the med. part of dorsum of foot then divides into 2 dorsal digital nerves:

- (a) One for the med. Side of the big toe.
- (b) One for the adjacent sides of the 2nd & 3rd toes.

* **The lateral terminal branch:** supplies the skin of the lat. part

of dorsum of foot then divides into 2 dorsal digital branches:

- One for the adjacent sides of the 3rd & 4th toes.
- One for the adjacent sides of the 4th & 5th toes



Injury of lateral popliteal (common peroneal) n.

* **Sites & causes:** wounds in the popliteal fossa or fracture of neck of fibula.

* **Effects:**

I- **Motor:**

- (1) Paralysis of the muscles of the ant. compartment of the leg (extensors) as they are supplied by the ant. tibial br. of the lat. popliteal n.
- (2) Paralysis of the muscles of the lat. compartment of the leg (evertors) as they are supplied by the musculocutaneous br. of the lat. popliteal n.

II- **Sensory:**

loss of sensation from the anterolateral aspect of the leg + the dorsum of the foot (except the med. & lat. borders).

III- **Deformity:** foot drop (due to paralysis of the extensors of the foot) + inversion (due to paralysis of the evertors of the foot) this deformity is called **Talipes equinovarus**



Injury of the tibial n. (med. popliteal) nerve

* **Sites & causes:** wounds in the popliteal fossa

* **Effects:**

I- **Motor:**

- Paralysis of the superficial & deep muscles of the back of leg.
- Paralysis of all muscles of the sole.

II- **Sensory:** loss of sensations from the sole of the foot.

III- **Deformity:** dorsiflexion & eversion of the ankle of the foot. this deformity is called **Talipes calcaneovalgus**.

Cutaneous innervation of the L.L.

(A) **The thigh:**

(1) **Skin of the groin** (junctional area between abdomen & front of thigh):

Is supplied by:

- | | |
|-------------------------------------|----------------------|
| (a) Ilioinguinal nerve | } From lumbar plexus |
| (b) Femoral br. of genitofemoral n. | |

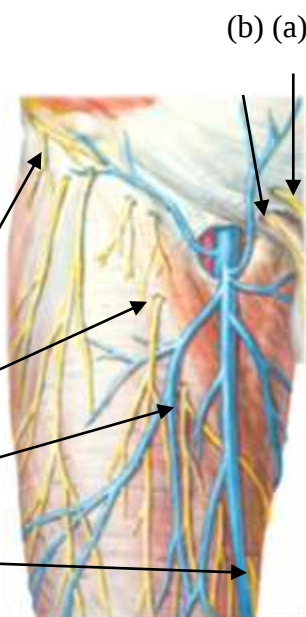
(2) **Lat. aspect of the thigh:** is supplied by the lat. cut. N. of thigh (br. From the lumbar plexus).

(3) **Ant. aspect of the thigh:** is supplied by the intermediate cut. N. of thigh (br. of femoral n.) (page 96)

(4) **Med. aspect of the thigh** is supplied:

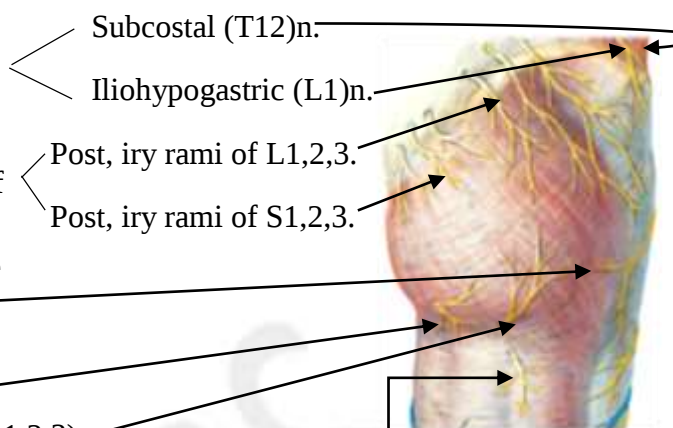
- (a) Med. Cut. of thigh (br. Of femoral n.): page 96.
- (b) Obturator n.: through its br. to the subsartorial plexus (page 54)

(5) **Skin around patella:** supplied by the patellar plexus (page 96).



(6) Skin of the gluteal region:

- (a) The upper & ant. parts are supplied by the lat. cut. brs. of
- (b) The upper & post. parts are supplied by the lat. cut. brs. of
- (c) The lower & ant. Parts are supplied by **branches** from the post. Division of lat. cutaneous n. of thigh.
- (d) The lower & post. Parts are supplied by:
- (1) Perforating cut. N. (S2,3)
 - (2) Brs. of pst. Cut. N. of the thigh (S1,2,3)

**(7) Skin of the back of the thigh:**

It is mainly supplied by the post. Cut. nerve of thigh (br. From the sacral plexus).

N.B: skin of the front of the thigh is supplied by branches from the lumbar plexus while back of the thigh is supplied by br. From the sacral plexus.

(B) Skin of the leg

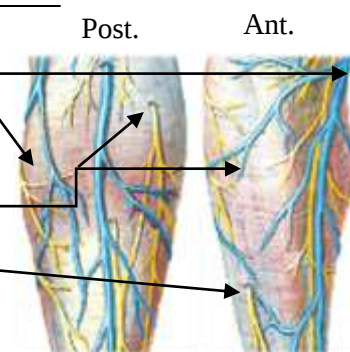
(1) Skin of the med. Side: supplied by saphenous n. (Br. From femoral n.)

(2) Skin of the antro-lateral side: is supplied by:

- (a) Lat. Cut. N. Of calf (br.fr common peroneal n.)
- (b) The superficial peroneal (musculocutaneous) n.

(3) Skin of the back of leg: is supplied by:

- (a) Post. Cut. N. Of thigh: to the upper $\frac{1}{3}$ of the back of leg.
- (b) Sural n. (From tibial n.) To lower $\frac{2}{3}$ of back of leg.
- (c) Lat. Cut. N. Of calf (from common peroneal): to the upper part of the back & lat. Side of the leg.

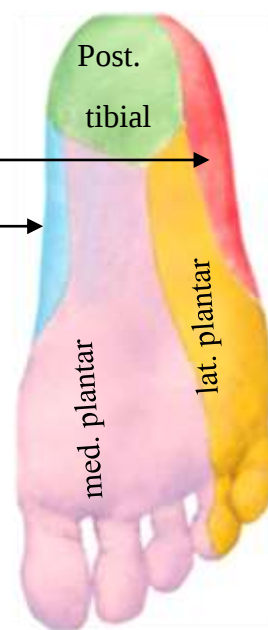
**(C) Skin of the foot:****(1) Sole of the foot:**

Supplied by post tibial, med. & lat. plantar nerves (for details: see page 103).

(2) Dorsum of the foot:

Supplied by the musculo-cutaneous n. except:

- (a) The lateral border which is supplied by **Sural n.**
- (b) The medial border which is supplied by **Saphenous n.**
- (c) The cleft between the 1st & 2nd toes: supplied by ant. Tibial n.



Segmental cutaneous innervation of L. L.

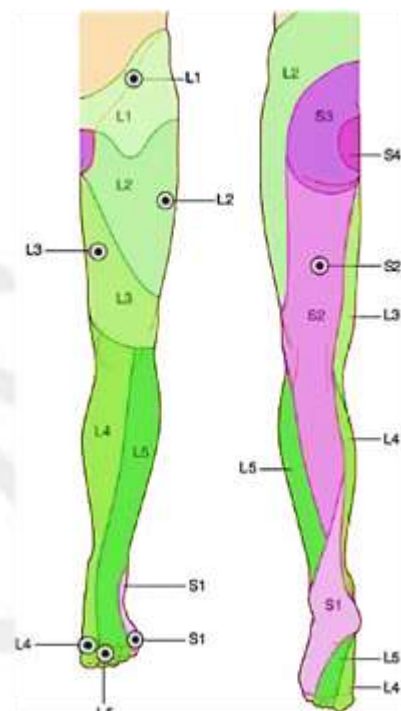
Dermatomes of the L. L.

The skin of the L. L. Is supplied by all lumbar segments & the upper 3 sacral segments of the spinal cord as follows:

- * **L1, 2, 3** supply the ant., the med. & the lat. Aspects of the thigh (arranged from above downwards in the same order).
- * **L4**: supplies the anteromedial aspect of the leg + the medial border of the foot & the big toe.
- * **L5**: supplies the anterolateral aspect of the leg + the medial part of the foot & the 2nd, 3rd&4th toes.

N. B: the ant. Border of tibia separates the derinatomes of L4&L5

- * **S1**: supplies the lat. aspect of the foot including the heel & the little toe.
- * **S2**: supplies a narrow vertical strip in the middle of the post. Aspect of the thigh & leg (extending from the dermatome of S3 at the gluteal region above to the dermatome of S1 at the heel below).
- * **S3**: supplies the skin of the gluteal region (lower& medial part).



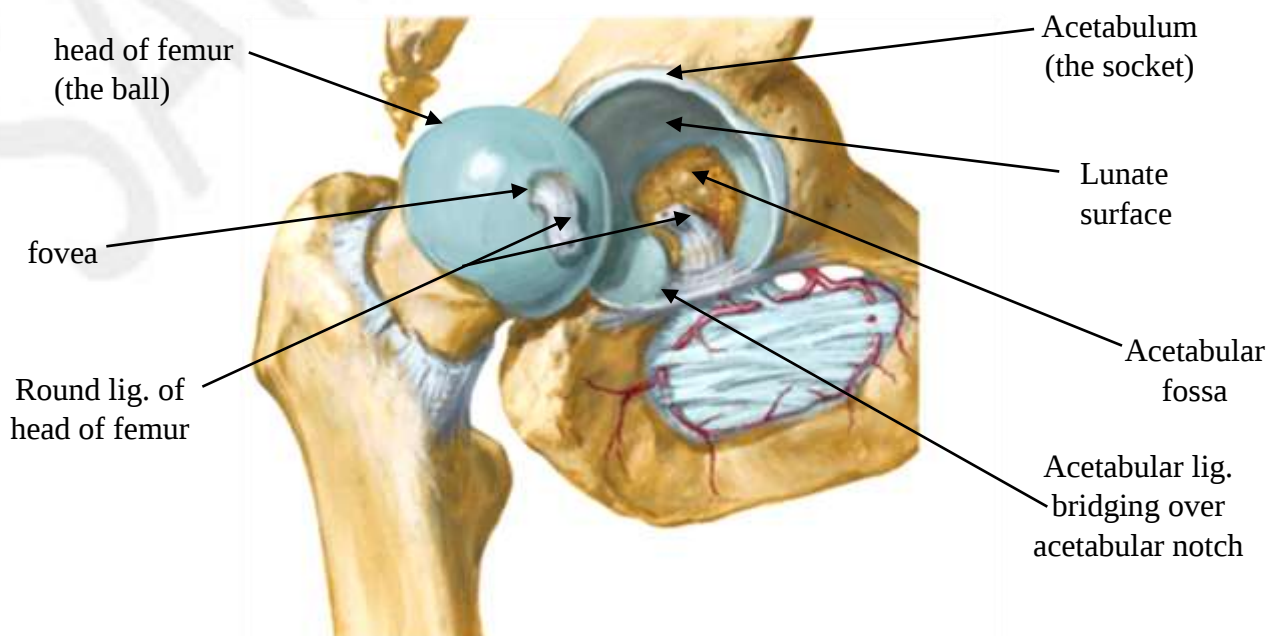
Joints of lower limb

1- Hip joint

I- **Type & variety** : synovial, ball & socket

II- **The articulating bones** & shape of their articular surfaces :

The head of femur(representing the ball) articulates with the acetabulum of the hip bone (representing the socket).



The head of femur	The acetabulum
* It is spherical in shape (forming about $\frac{3}{5}$ of a sphere). * It is directed upwards, backwards & medially. * It is smooth & covered by an articular hyaline cartilage except the central depression called the fovea which gives attachment to the round ligament of the head.	* It is deep cup-shaped concavity in the lat. Aspect of the hip bone. * It is directed downwards, forwards & laterally. * It has a c-shaped smooth articular surface called the lunate surface which is covered by hyaline cartilage. * Its margin is deficient below forming the acetabular notch which is bridged over by the transverse acetabular lig. * A lip of fibrocartilage called labrum acetabulare is attached to its margins. * Its centre shows a rough non-articular acetabular fossa.

III- The fibrous capsule:

* It is a strong fibrous sleeve connecting the articulating bones.

* **Attachments:**

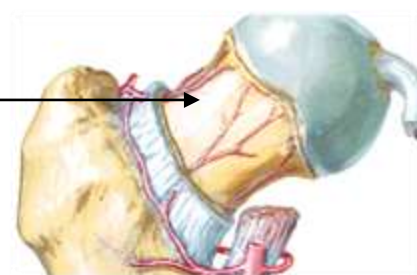
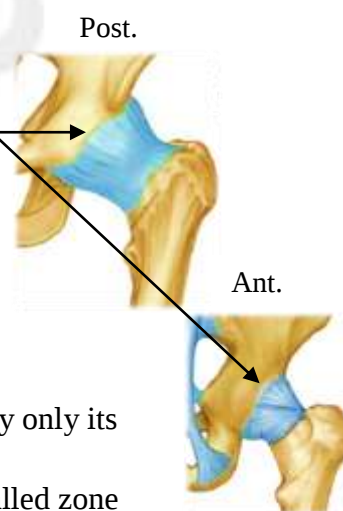
- Proximally:** it is attached to the circumference of the acetabulum $\frac{1}{2}$ cm outside the labrum acetabulare.
- Distally:** it is attached anteriorly to the inter-trochanteric line & posteriorly to the neck of femur $\frac{1}{2}$ an inch above the intertrochanteric crest.

N. B:

- (1) This means that anteriorly, the neck is completely inside the capsule while posteriorly only its med. $\frac{1}{2}$ is intracapsular while its lat. $\frac{1}{2}$ is extracapsular.
- (2) The capsule is made up of two types of fibers: outer longitudinal & inner circular (called zone orbicularis)
- (3) The longitudinal fibers are maximal anterosuperiorly where many of them are reflected along the neck of femur forming the retinaculæ of the capsule.

* **Functions:** (1) carry blood supply to the head

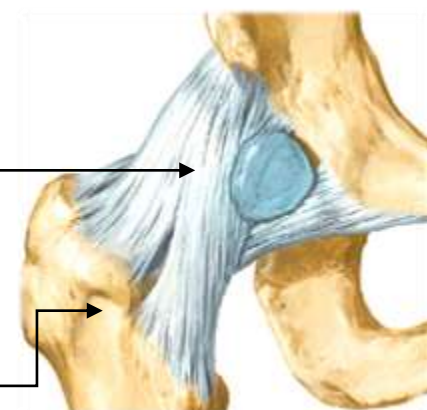
(2) Retain the fragmented segments in fracture neck of femur.



IV- The ligaments: 3 ligaments strengthen the capsule externally :

(1) The iliofemoral ligament:

- It is the **strongest ligament in the body** ($\frac{1}{2}$ - 1cm thick).
- Shape: inverted Y-shape having a stem & 2 limbs.
- Site: lies on the ant. Aspect of the capsule.
- **Attachments:**
 - The proximal narrow stem is attached to the ant. inf. iliac spine. *
 - The distal 2 limbs are attached below to the upper & lower parts of the intertrochanteric line.



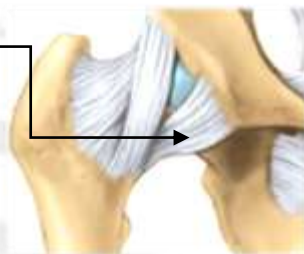
– Functions :

- (1) It strengthens the ant. Aspect of the capsule.
- (2) It prevents hyperextension & excessive lat. Rotation of hip joint.

N. B: there is a tendency for hyperextension to occur in the hip joint as the line of the body weight passes behind the centre of the joint.

(2) Pubofemoral ligament :

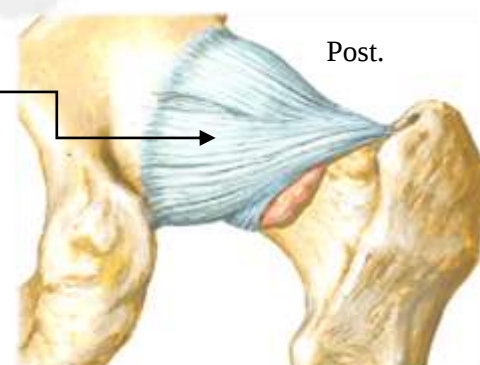
- * Shape : triangular
- * Site: lies on the inferomedial aspect of the capsule.
- * Attachments :
 - Its proximal part or base is attached to the iliopubic eminence of hip bone.
 - Its distal end or part is attached to the neck of femur just above & in front of the lesser trochanter.



- * Functions: (1) strengthens the inferomed. aspect of the capsule.
- (2) Prevents over abduction of the hip joint.

(3) Ischiofemoral ligament :

- * It is the weakest lig. & lies on the back of the hip joint.
- * It arises from the posteroinferior margin of the acetabulum.
- * Its fibers pass upwards & laterally twisting around the capsule & blending with it forming the zone orbicularis.
- * Functions: it screws the femoral head medially into the acetabulum, preventing hyperextension of the hip.



(4) Labrum acetabulare:

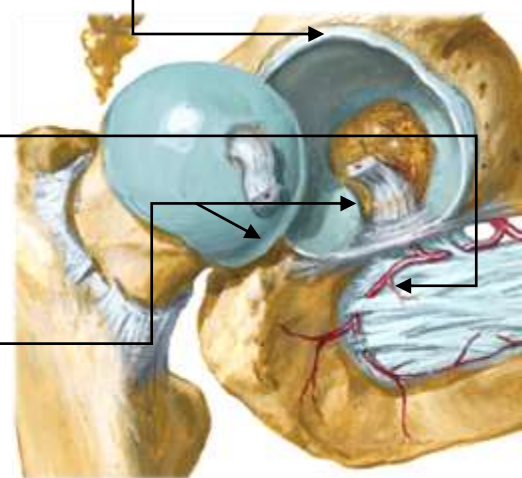
- * It is a ring of fibrocartilage fixed to rim of the acetabulum to deepen its cavity.

(5) Transverse acetabular ligament :

- * It is a strong fibrous band bridging over the acetabular notch
- * It converts the acetabular notch into foramen through which nerves & blood vessels pass to the round lig. of the head of femur.

(6) Ligament of head of femur (round lig. or ligamentum teres):

- * It is a triangular flat ligament.
- * Its apex is attached to the pit or fovea of the head of femur.
- * Its base is attached to the transverse acetabular lig.
- * Function: it transmits arteries to the head of femur (from the acetabular branches of obturator & med. Circumflex femoral arteries).



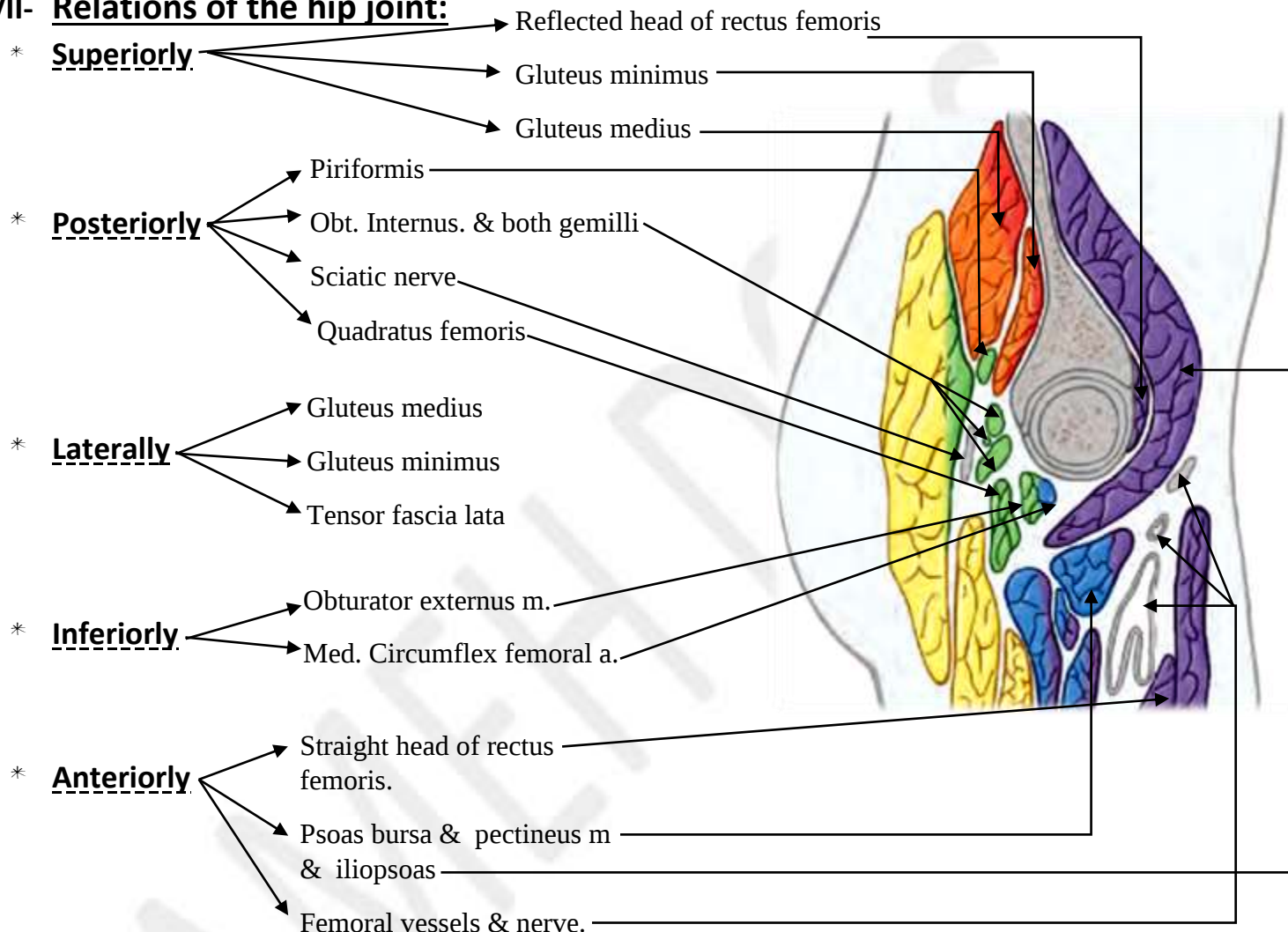
N. B: it has no role in stabilizing the joint because it is weak & becomes tense only when the thigh is flexed & adducted.

V- The synovial membrane: it lines the fibrous capsule, intracapsular portion of the neck of femur, labrum acetabulare, transverse acetabular lig., fat in the acetabular fossa & also invests the round lig. Of the head of femur.

VI- Intracapsular structures :

(1) labrum acetabulare (2) transverse acetabular lig. (3) Ligamentum teres.

VII- Relations of the hip joint:

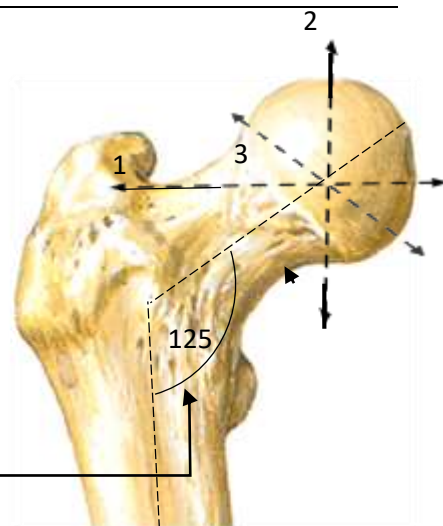


Movements allowed & their axes

- (1) **Flexion & extension:** occur around a transverse axis.
- (2) **Medial & lateral rotation:** occur around a vertical axis.
- (3) **Abduction & adduction:** occur around an anteroposterior axis.
- (4) **Circumduction:** is a combination of the above-mentioned movements.

N. B: the wide range of movements of the hip joint is due to:

- (a) The presence of angle between the neck & shaft of femur (neck-shaft angle).
- (b) The length of the femur.
- (c) The neck of femur is narrow than the head this allows a considerable movement before the head impinges on labrum acetabulare.

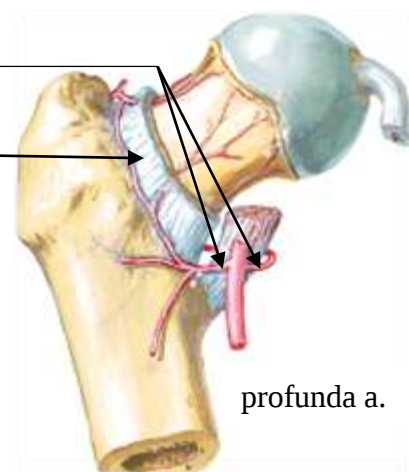


Muscles producing movements in the hip joint:

Movement	Chief muscles responsible	Accessory muscles helping
1- Flexion	– Iliopsoas (psoas major + iliacus)	– Pectineus, rectus femoris & sartorius. – Adductors (mainly adductor longus.)
2- Extension	– <u>Gluteus maximus</u> : during standing from sitting position, running & climbing upstairs. – <u>Hamstring</u> : on walking on a level	
3- Abduction	– Gluteus medius & minimus.	– Tensor fascia latae & sartorius
4- Adduction	– Adductors (longus, brevis & magnus).	– Pectineus & gracilis
5- Med. Rotation	– Ant. fibres of gluteus medius minimus	
6- Lat. Rotation	– The 6 lateral rotators	– Gluteus maximus & sartorius

* Blood supply of the hip joint:

- (a) Medial & lateral circumflex femoral arteries (branches of profunda a.)
From an arterial circle around the capsular attachment on the neck of femur. Retinacular arteries arise from this circle and supply the intracapsular part of the neck & the greater part of the head of femur
- (b) A small part of the head is supplied by arteries passing along the ligament of head of femur (derived from the acetabular brs. of obturator & med. circumflex femoral arteries).



profunda a.

* Nerve Supply

- (1) Femoral n., through the nerve to rectus femoris.
- (2) Ant. Division of obturator n. sciatic n. N. To quadratus femoris.

* Stability of the hip joint: it is very stable joint due to the following factors:

- (1) **Bony factor**: the spherical head of femur fits well in the deep acetabulum.
- (2) **Ligaments factor**: the capsule is strong & is reinforced by very strong ligaments especially the iliogemoral lig.
- (3) **Muscular factor**: the joint is surrounded all around by strong muscles.

Applied anatomy

- (1) **Fracture of femoral neck**: common in old persons (especially women) due to osteoporosis. It is commonly intracapsular. High fracture of the neck leads to cutting the blood supply of the head of femur (page 12) avascular necrosis of the head.



(2) **Dislocation of the hip joint:** may be: (a) congenital: the head of femur slips upwards on to the gluteal surface of ilium because the upper margin of acetabulum is congenitally deficient.

(b) Acquired: commonly post. Dislocation occurring in car accidents forcing the head out of the acetabulum & may lead to injury of the sciatic nerve.

(3) **Coxa vara:** abnormal decrease in the neck-shaft angle causing mild shortening of the lower limb.

(4) **Coxa valga:** abnormal increase in the neck-shaft angle causing mild lengthening of the lower limb.

Knee Joint

I- **Type & variety:** synovial condyloid (modified hinge) because it allows some med. & lat. Rotation in addition to flexion& extension occurring in the classical hinge joint.

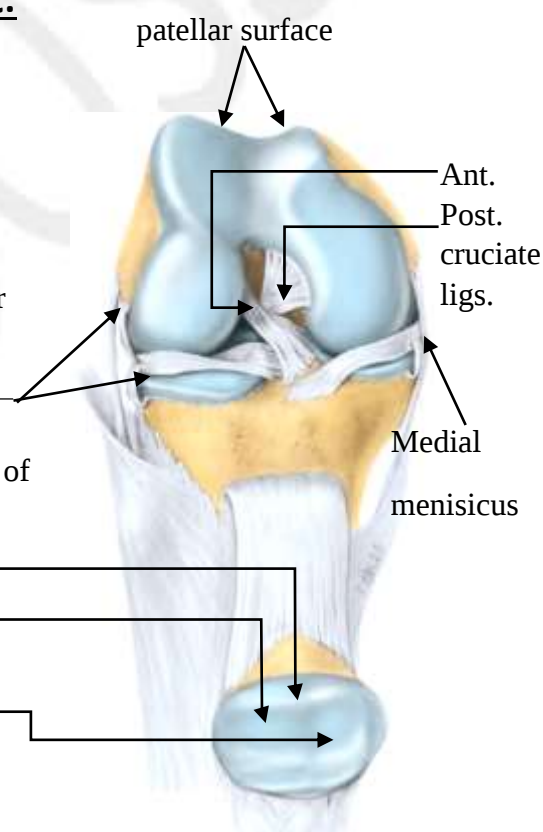
II- Articular surfaces of the bones forming the joint:

The articulating bones include:

- (1) The lower end of femur.
- (2) The upper end of tibia.
- (3) The posterior surface of the patella.

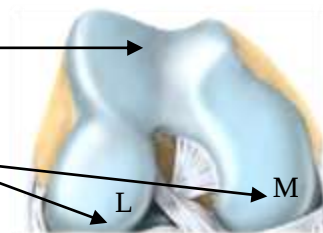
The joint consists of 3 articulations:

- (1) Femoro patellar articulation between patellar surface of lower end of femur& the post. Surface of patella
- (2) Lateral femoro tibial articulation between the lat. condyle of femur & lat. Condyle of tibia.
- (3) Medial femoro tibial articulation: between the med. condyle of femur& med. Condyle of tibia.
- (4) The post. Surface of patella is divided by vertical ridge into:
 - (a) A large lateral articular area : for patellar surface of the lat. Condyle of femur
 - (b) A smaller medial articular area: for patellar surface of the med. Condyle of femur.



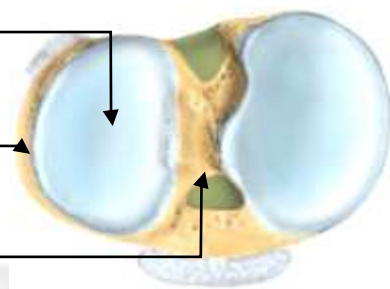
* The articular surface of the lower end of the femur:

- It is inverted Y-shaped having a stem & 2 limbs (Rt.& Lt.)
- The stem of the Y represents the patellar surface & divided by a groove into a larger lat. Part & a smaller med. Part.
- The 2 limbs of the Y represent the articular surfaces of the 2 condyles of femur, each of them is convex, covering the inf. & post. Surfaces of the femoral condyles (for details see page 14)



* The articular surface of upper end of tibia:

- The upper surface of the lat. Condyle shows circular articular facet which is deepened by the attachment of the lat. Meniscus to its periphery.
- The upper surface of the med. Condyle shows an oval articular facet which is deepened by the attachment of the med. meniscus.
- The 2 condylar articular surfaces are separated by intercondylar area which is divided into ant. & post. Parts by the intercondylar eminence (for details see page 20).



III- Fibrous capsule:

- Characters:

- It is thin & deficient anteriorly where it is replaced by the
- It is strengthened by expansions from the surrounding muscles: 1) semimembranosus (posteriorly) 2) Vastus lateralis & iliotibial tract (laterally) 3) Vastus medialis (medially)
- It has 2 perforations:
 - One anterosuperiorly: for the suprapatellar bursa.
 - One posteriorly: for the exit of the popliteus tendon.

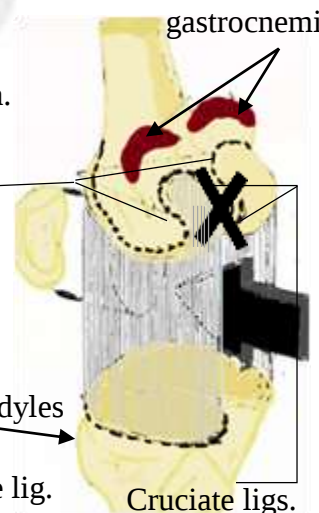
- Attachments:

- Femoral attachment: it is attached ½ cm beyond margins of articular surfaces of
- the 2 femoral condyles (except in front). On the lat. Aspect, the capsule is attached just above the groove for popliteus (just below lat. Epicondyle)

N. B: the ed. & lat. Epicondyles lie outside the capsular attachment.

- Tibial attachment: it is attached ½ cm beyond the articular surfaces of the tibial condyles except: anteriorly where it is deficient (attached to the patellar lig.) Posteriorly where it is attached to the intercondylar ridge which limits the attachment of the post. Cruciate lig.

quadriceps tendon
patella
patellar lig



Synovial membrane:

It lines the capsule except posteriorly where it is reflected by the cruciate ligaments.

Anteriorly, it extends upwards above the patella forming suprapatellar bursa.

Below the patella, it covers the deep surface of infrapatellar pad of fat forming the infrapatellar fold whose sides extend laterally forming the alar folds.



IV- Ligaments of the knee joint:

- Extracapsular
 - One on each side: tibial & fibular collateral lig.
 - One in front: the **patellar lig.**
 - One behind: **oblique popliteal lig.**

- Intracapsular
 - 2 cruciate ligaments : ant. & post.
 - 2 semilunar cartilages (menisci) : med. & lat.
 - Transverse ligament of the knee.
 - Coronary ligaments

(1) Patellar ligament : about 3 long, connecting the apex of the patella to the tibial tuberosity

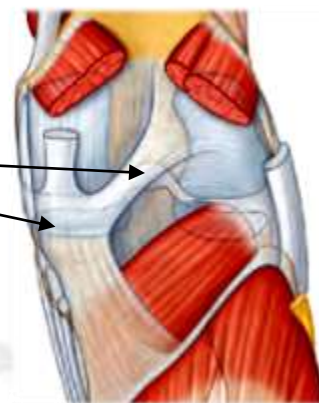
(2) Oblique popliteal ligament :

It is an expansion of the tendon of semimembranosus muscle

It runs upwards & laterally to be attached to the intercondylar line & lat.

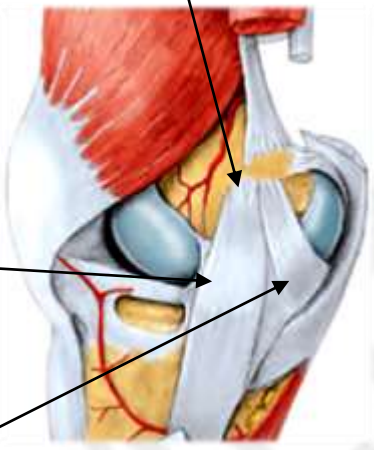
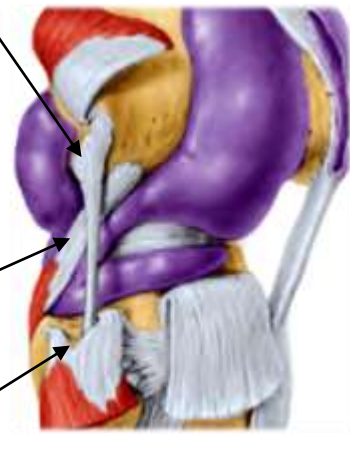
Condyle of femur

It strengthens the capsule posteriorly & prevents hyperextension of the knee joint



N. B. the arcuate popliteal lig. is arched fibers of the capsule over the tendon of popliteus. It is attached to the head of fibula & the post. Intercondylar area of tibia.

Collateral ligaments

Medical (tibial) collateral lig.	Lateral (fibular) collateral lig.
* <u>Shape</u>: strong flat triangular band. * <u>Attachments</u> : - <u>Above</u>: it is attached to med. Epicondyle - <u>Below</u>: it divides into ant. & post. Parts: Ant. (Superficial) part: attached to the upper part of tibia behind S. G. S. Tendons & separated from them by bursa Post. (Deep) part: attached to the med. Condyle of tibia 	It is a strong rounded cord. * <u>Attachments</u>: - <u>Above</u>: it is attached to lat. epicondyle - <u>Below</u>: it is embraced by biceps tendon then becomes attached to head of fibula - It is related to 2 tendons Popliteal tendon (deeply) separating it from lat. Meniscus Biceps tendon (superficially) 
* Its deep part is firmly attached to the capsule & the med meniscus * Becomes tense in extension * May be torn in violent abduction of the leg. 	* It is not adherent to either the capsule or the lat. Meniscus * Becomes tense in extension also * May be torn in violent adduction of the leg. 
Both ligaments contribute to the side to side stability of the knee joint.	

* Inracapsular structures:

Menisci (med. & lat.)

Cruciate ligaments (ant. & post.)

Coronary ligaments

Transverse ligament of the knee.

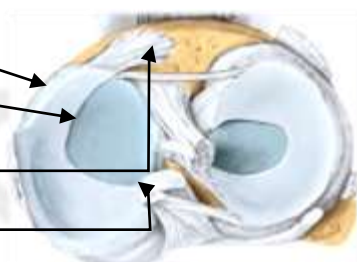
Tendon of popliteus m.

(1) **Med. & lateral semilunar cartilages (menisci):**

Each meniscus is a curved plate of fibrocartilage which lies on the upper surface of the corresponding condyle of tibia.

Each meniscus has:

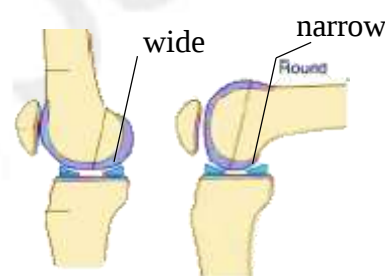
- (a) Outer border: thick, convex & fixed to the capsule.
- (b) Inner border: thin, concave & free.
- (c) Upper surface: is concave for the femur.
- (d) Lower surface: flat & applied on the peripheral $\frac{2}{3}$ of tibial condyle.
- (e) Ant. Horn: attached to the ant. intercondylar area.
- (f) Post. Horn: attached to the post. intercondylar area.



N.B: the menisci are not covered by synovial membrane.

* Functions of the menisci:

- (1) They deepen the articular surface of the tibial condyles.
- (2) They are essential for rotatory movements of the knee (they move with femur on the tibia).
- (3) They adapt their contours to the varying curvature of the different parts of femoral condyles allowing gentle femoro-tibial in all positions.
- (4) They act as shock absorbers.



Medial meniscus		Lateral meniscus	
Shape	C- shaped & broader posteriorly	It is nearly circular & smaller than med. Meniscus.	
Attachments	* Its ant. Horn is attached to the most ant. Part of the ant. intercondylar area. * Its post. Horn is attached to the post. intercondylar area just in front of post. cruciate lig.	* Its ant. Horn is attached just in front of the intercondylar eminence. * Its post. Horn is attached just behind the intercondylar eminence.	
Mobility	It is more fixed being adherent to the deep part of the tibial collateral lig. & to the fibrous capsule.	* It is more mobile being separated from the capsule & fibular collateral lig. by the popliteus tendon which is attached to the lat. meniscus controlling its mobility.	
Injury	Being more fixed, it cannot adapt itself to sudden rotatory movements of the lower end of femur so it is more liable to injury 20 times more than the lat. meniscus.		Being more mobile, it can adapt itself to sudden rotatory movements so it is less liable to injury than the med. meniscus

The coronary ligaments:

- The fibrous capsule is attached to the periphery of the menisci. The capsular fibers that attach to the tibial condyle is called coronary ligament.

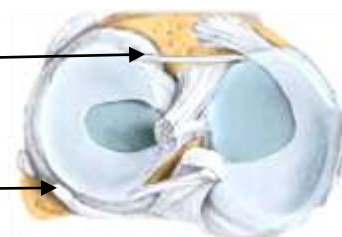


Transverse lig. Of the knee:

It connects the ant. Ends of both menisci thus coordinates their movements.

Popliteus tendon:

It is intracapsular extrasynovial. It is attached to the **post. part of lat. meniscus**.



Cruciate Ligaments

- * They are 2 strong thick fibrous bands (ant. & post.) arranged like the limbs of the letter X inside the knee joint connecting femur & tibia.
- * They are named ant. & post. According to their attachment to the tibia.

Ant. Cruciate ligament		Post. Cruciate ligament
(1) <u>Attachment to tibia:</u> To the ant. intercondylar area behind the ant. Horn of the med. Meniscus.	The diagram shows a frontal view of the knee joint. The femur is at the top, and the tibia is at the bottom. The intercondylar notch is labeled. The anterior cruciate ligament (ACL) is shown running from the anterior intercondylar area of the tibia to the posterior part of the femur. The posterior cruciate ligament (PCL) is shown running from the posterior intercondylar area of the tibia to the anterior part of the femur. Arrows indicate the direction of the ligaments.	(1) <u>Attachment to tibia:</u> To the most post. part of the post. intercondylar area behind the post. Horn of the med. Meniscus.
(2) <u>Course:</u> runs upwards, backwards & laterally, twisting on itself.		(2) <u>Course:</u> runs upwards, forwards & medially, twisting on itself.
(3) <u>Attachment to the femur:</u> to the post. Part of inner aspect of lat. condyle of femur.		(3) <u>Attachment to the femur:</u> to the ant. Part of inner surface of med. condyle of femur.
(4) It is <u>stretched</u> in extension of the knee.		(4) It is <u>stretched</u> in flexion of the knee.
(5) It is weaker than the post. Cruciate lig.		(5) It is stronger than the ant. Cruciate lig.
(6) <u>Function:</u> (a) it limits hyper extension of the knee (b) it prevents post. Displacement of femur on tibia.		(6) <u>Function:</u> it prevents ant. dislocation of femur on tibia.

Bursae around the knee:**(A) On the ant. Aspect (4 bursae):**

- (1) Suprapatellar bursa: it is an upward extension of the synovial membrane. It lies between lower part of quadriceps femoris & the lower part of femur.
- (2) Prepatellar bursa: in front of patella.
- (3) Deep infrapatellar bursa: between patellar lig. & the upper end of the tibia.
- (4) Subcutaneous infrapatellar bursa: between the skin & tibial tuberosity

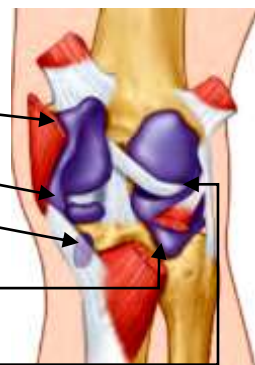
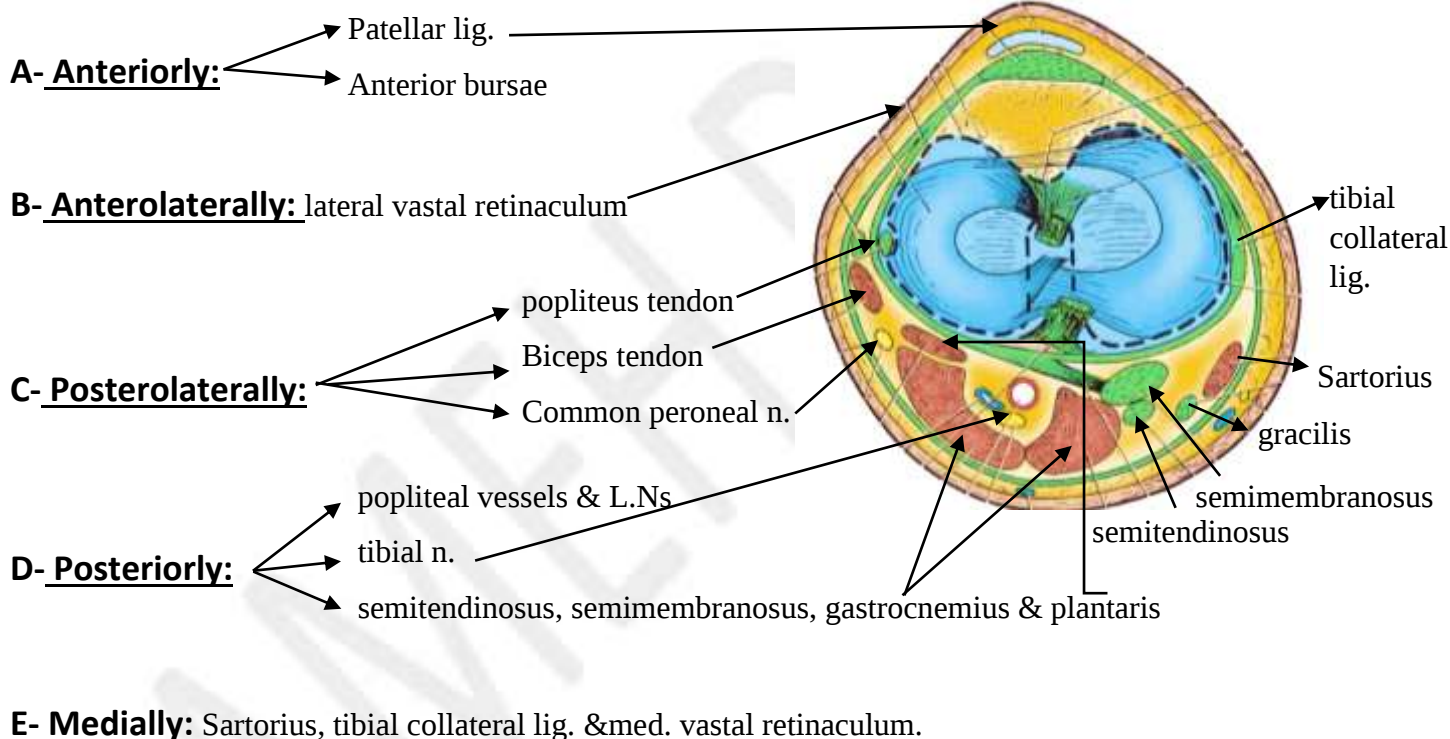


(B) On the posteromedial aspect (3 bursae):

- (1) Bursa between the capsule & the med. Head of gastrocnemius.
- (2) Bursa between the capsule semimembranosus tendon.
- (3) Bursa between the med. lig. & the tendons of S.G.S.

(C) On the posterolateral aspect (3 bursae):

- (1) Bursa between popliteus tendon & lat. condyle of tibia.
- (2) Bursa between the capsule & the lat. head of gastrocnemius.
- (3) Bursa between the biceps tendon & fibular collateral ligament.

*** Relations of the knee joint:***** Blood Supply** of knee joint: anastomosis around the knee joint (p. 82).*** Nerve Supply:**

- (1) **Femoral n.:** through its branches to vasti, especially vastus medialis.
- (2) **Sciatic n.:** through the genicular brs. of tibial & common peroneal nerves.
- (3) **Obturator n.:** its post. division.

Movements allowed & Muscles responsible

Movements	Muscles responsible
1- Flexion	- <u>main muscles</u>: hamstrings (biceps, semitendinosus & semimembranosus). - <u>helped by</u>: Sartorius, gracilis, gastrocnemius, popliteus & plantaris.
2- Extension	- by quadriceps femoris. - helped by tensor fascia latae m.
3- Medial rotation	- popliteus: produces med. rotation of tibia at the beginning of flexion (unlocks the knee). - SGS & semimembranosus produce med. rotation of the flexed knee.
4- lat. rotation	- biceps femoris (when the knee in flexion).

N.B: (1) Flexion & extension occur in the upper compartment of the joint (above the menisci).

(2) Rotatory movements occur in the lower compartment of the joint (below the menisci).

Locking & unlocking of the knee (conjunction-rotation):

(A) Locking of the knee occurs by the following mechanism:

- (1) as the knee moves into full extension, the ant. cruciate lig. becomes tight thus terminating the movement (extension) of the lat. condyle of femur
- (2) the med. condyle of femur continues movement (while the lat. condyle has stopped), this leads to passive med. rotation of femur (lat. rotation of tibia).
- (3) this rotation which occurs at the end of extension leads to tightening of the ligaments of the joint (mainly the collateral & cruciate ligaments) makes the joint rigid i.e. locked.



(B) Unlocking: to begin flexion, the popliteus m. produces lat. rotation of femur on tibia (when the feet are supporting the body weight) this leads to untwisting of the tight ligaments → movement can occur i.e. Unlocking the unlocked knee can further Flex by the hamstrings.



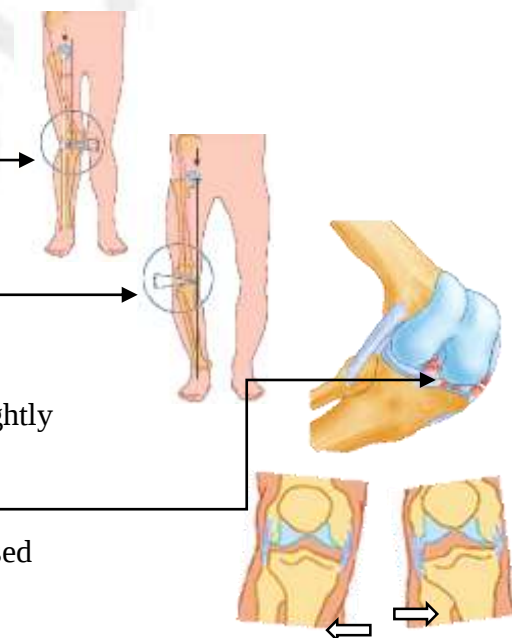
* Stability of the knee joint:

it is a very stable joint due to the following factors:

- (1) **Bony factors:** the intercondylar eminence of the tibia projects into the intercondylar notch of femur preventing side-to-side dislocation.
- (2) **Ligamentous factors:**
 - (a) cruciate ligaments are essential for anteroposterior stability in flexion.
 - (b) collateral ligaments & the oblique popliteal lig. are responsible for side-to-side stability & stability in extension.
- (3) **Muscular factors:**
 - (a) the joint is surrounded by strong muscles.
 - (b) the med. & lat. vastal retinacula stabilize the patella.
 - (c) the iliotibial tract stabilizes the slightly flexed knee.

Applied Anatomy

- (1) **Genu Valgum** or knock knee:
the leg is abnormally abducted leading to increase compression on the lat. condyle of femur & the lat. meniscus.
- (2) **Genu Varum** (bow legs)
the leg is abnormally adducted leading to increase compressive forces of the med. condyle of femur & the med. meniscus
- (3) **Genu recurvatum:** it is hyperextension of the knee
- (4) **Injury to menisci :** is commonly due to twisting strains in a slightly flexed knee as in football players the med-meniscus is more vulnerable to injury than the lat. (see page 117)
- (5) **Injury of collateral ligaments** is less common & may be caused by severe abduction or adduction strains.



Superior Tibiofibular Joint

- I- **Type:** Synovial & **Variety:** plane
- II- **Bony articular surfaces:**
 - fibular Facet of tibia (on post lat. aspect of lat. condyle)
 - articular facet of head of fibula
- III- **Capsule & ligaments:** The capsule is attached around the margins of the articular surfaces & strengthened by ant. & post. tibiofibular ligament.
- IV- **Movements allowed:** Sliding movements.

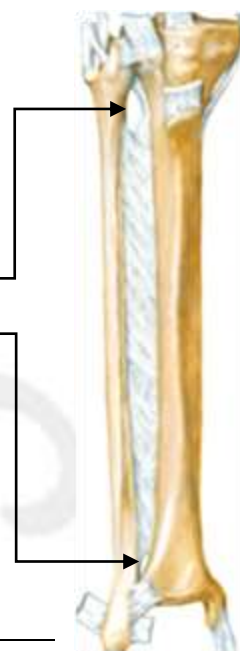
Interosseous membrane between Tibia & Fibula

- * It is considered as Fibrous Joint (syndysmosis)
- * **Attachment:** It connects the interosseous borders of tibia & fibula.
- * **Direction of fibers:** Downwards & laterally from tibia to fibula.
- * **Structures piercing it:**

- 1) Near its upper end: it is pierced by ant. tibial vessels
- 2) Near its lower end: it is pierced by perforating br. of peroneal artery

* **Muscles arising from it:**

- Anteriorly: 4 muscles
- | | |
|-------------------------|---------------------------|
| (1) Tibialis ant | (2) Ext: digitorum longus |
| (3) Ext hallucis longus | (4) Peroneus tertius |
- Posteriorly: Only one muscle: tibialis posterior



Inferior Tibio-Fibular Joint

- I- **Type & Variety:** Fibrous, syndysmosis
- II- **Articulating bones:** (1) Fibular notch of lower end of tibia
(2) The med surface of lower end of fibula (rough area)
- III- **Ligaments:**
- 1) Interosseous tibio-fibular lig.: a very strong lig. filling gap between articular surfaces.
 - 2) Posterior tibio-fibular lig.
 - 3) Anterior tibio-fibular lig.
- IV- **Movements:** It is an immobile Joint to prevent the separation of the 2 bones under the effect of body weight.



Ankle Joint

- I- **Type & Variety:** synovial , hinge
- II- **Articular surfaces:**
- (1) **Proximally:** The articular surface is formed of:
 - a) Inferior surface of lower end of tibia
 - b) Lateral surface of the med. malleolus
 - c) Medial surface of the lat. malleolus
 - (2) **Distally:** the trochlear Surface of body of talus.



III- Fibrous capsule:

- * It is attached to the margins of the articular surfaces proximally & distal.
- * It is weak in front & behind but thick medially & laterally being strengthened by collateral ligaments (like all hinge Joints).

IV- Ligaments:

(1) The medial lig. of ankle (Deltoid lig.):

- * It is one of the strongest ligaments in the body (next to the iliofemoral & interosseous sacroiliac ligaments)

- * Shape: It is broad, thick triangular band.

- * Attachments:

(a) Superiorly: attached by its apex to the tip, art. & post. borders of med. m.

(b) Inferiorly: attached by its base to the following structures (from before backwards):

- (1) Tuberosity of Navicular bone.
- (2) Medial border of spring lig. (Plantar Calcaneonavicular lig.).
- (3) The neck of talus.
- (4) The sustentaculum tali.
- (5) The body of talus.

- * Its attachment to the spring lig. helps to maintain the medial longitude arch of foot by supporting the head of talus (See [Arches of foot p 129](#))

- * NB: The strength of the deltoid lig. compensates for the shortness of the medial malleolus.

(2) The lateral ligament of ankle:

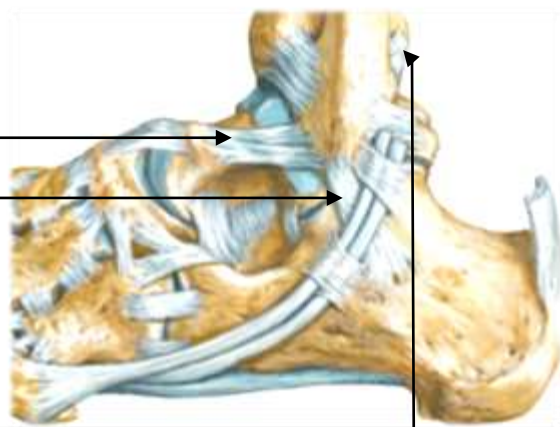
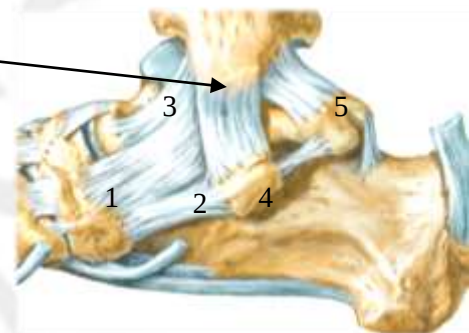
is formed of 3 separate bands:

(a) the ant. talofibular lig: extends from the lat. malleolus to the neck of talus .

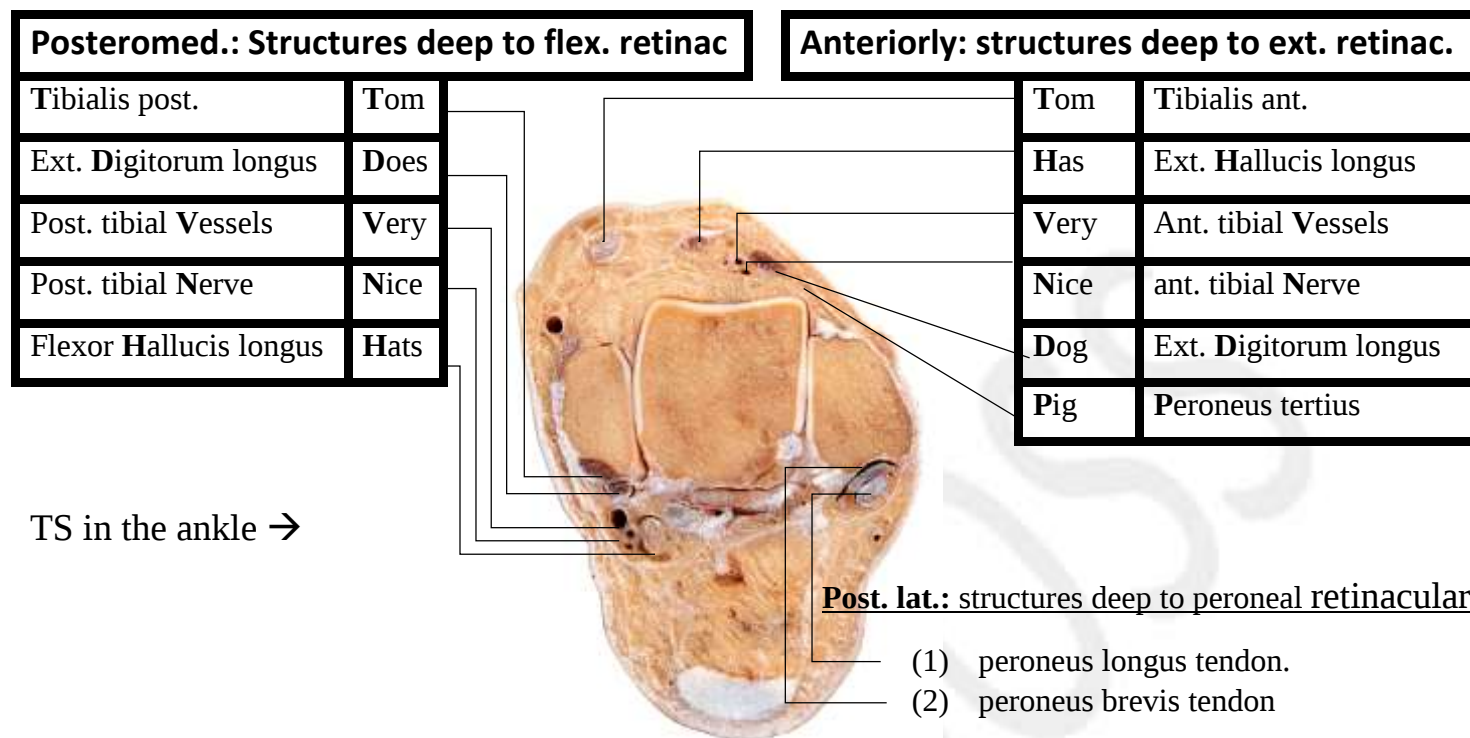
(b) the calcaneofibular lig.: is a stronger band extending

downwards & backwards from the tip of lat. malleolus to the lat. surface of calcaneus.

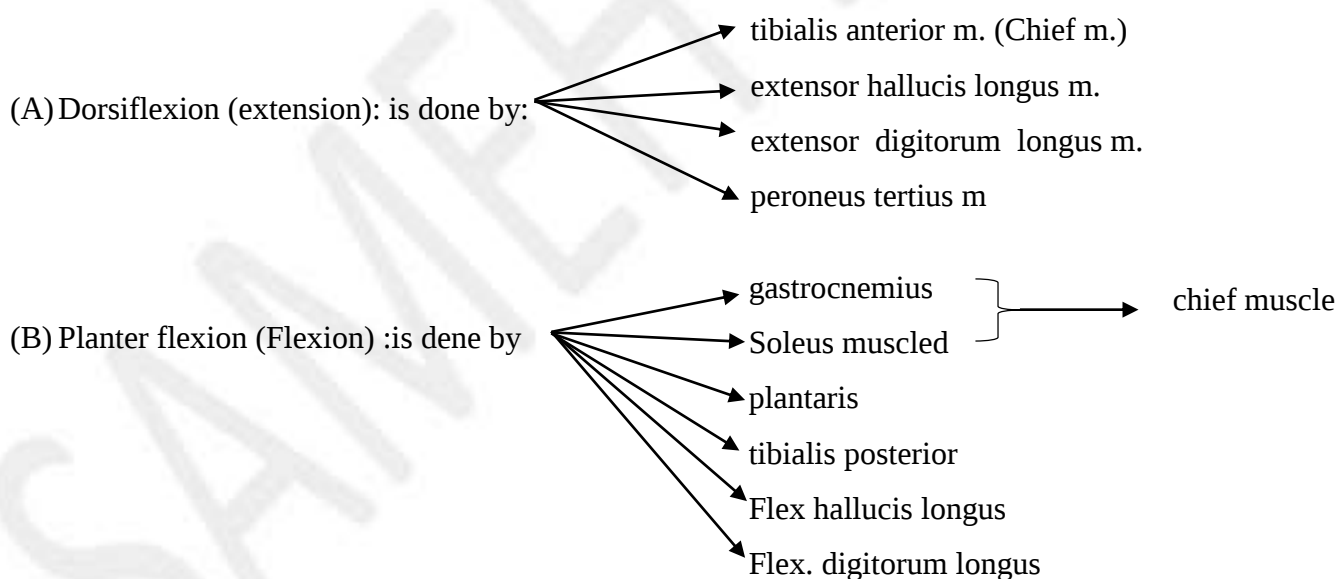
(c) the post. talofibular lig. : is a strong band extending from the malleolar fossa medially to be attached to the past. process of talus.



V- Relations of Ankle joint:



VI- Movements allowed & muscles responsible:



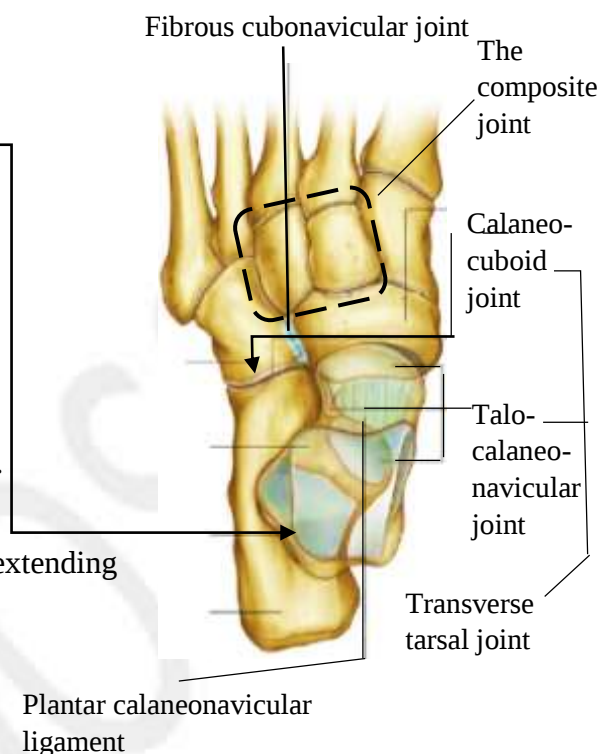
VII- Nerve Supply: branches from the deep peroneal & tibial nerves.

VIII- Blood Supply: From the anastomosis around ankle (see page 86)

Joints of the foot

(1) Subtalar (talo-calcaneal) joint:

- I- Type & variety: modified plane synovial Joint
- II- Articular Surfaces:
 - (a) the lower articular surface of the body of talus.
 - (b) the post. convex facet on the upper surface of calcaneus
- III- Capsule:
 - attached to the margins of the articular surfaces of both bones.
- IV- Ligaments:
 - the most important lig. is the interosseous talo-calcaneal lig. extending between the calcaneal sulcus & talar sulcus.
- V- Movements:
 - eversion & inversion (see page 126).



(2) Talo-Calcanéo-navicular joint:

- * it is the med. part of the midtarsal joint
- I- Type a variety: synovial, modified type of ball & socket.
- II- Articular Surfaces:
 - (1) the ball: is Formed by the head of the talus
 - (2) the Socket is formed as follows:
 - (A) Inferiorly by: (a) Calcaneus (one facet on the upper surface of the sustentaculum & the other on the ant. part of upper surface of calcaneus.
 - (b) by the med. limb of bifurcate lig. (between upper surface of Calcaneus & lat. surface of navicular).
 - (c) the spring lig. (plantar Calcaneonavicular lig.).
 - (B) Anteriorly: by the facet on the back of navicular bone
 - (C) Medially: by the ant. part of the deltoid lig.

(3) The Calcaneo-cuboid joint :

- * it forms the lat. part of the mid tarsal joint
- I- Type & variety: Synovial, Saddle.
- II- Articular Surfaces: (a) the ant. surface of calcaneus (posteriorly).
(b) the post. surface of cuboid (anteriorly).

III- Capsule: attached around the margins of the articular surfaces

IV- Ligaments:

- (1) Lat. limb of bifurcate lig.
- (2) short plantar lig. (plantar calcaneo-cuboid lig.).
- (3) long plantar lig.
- (4) dorsal calcaneo-Cuboid lig.

Inversion & Eversion

Inversion		Eversion	
			
Definition	- it is the movement of turning the Sole of the foot medially. - it is usually accompanied by slight plantar Flexion of the ankle.	- it is the movement of turning the sole of the foot laterally. - it is usually accompanied by slight dorsi flexion of the ankle.	
Joints concerned	(1) the sub-talar (talo calcanean) joint. (2) the talo-Calcanéo-navicular joint (med. part of the midtarsal joint). (3) the calcaneo-cuboid joint (lat. part of the midtarsal joint)		
Muscles acting	(1) tibialis anterior. (2) tibialis posterior.	(1) peroneus longus. (2) peroneus brevis. (3) peroneus tertius.	
Factors limiting	(1) tension of the peroneal muscles (2) tension of the interosseous talo-calcanean lig.	(3) tension of tibialis ant. & post. M. (4) tension of the deltoid lig.	

Inversion		Eversion	
axis around which movement occur	passes obliquely upwards, forwards & medially from the back of calcaneus to a point just medial to the neck of talus.		
Mechanism of the movement	the talus is fixed (by the 2 malleoli) while the calcaneus and the navicular bones swing around it carrying the other bones of the. foot with them.		
<u>N.B</u>	(1) Eversion & inversion do not occur at the ankle joint. (2) Eversion & inversion occur mainly during walking on rough ground.		

(4) The Composite joint

- * It is the Joint between the navicular, the cuboid the 3 cuneiform bones & the bases of the 2nd & 3rd metacarpal bones
- * All these articulations have one joint cavity.
- * The movements allowed are of the gliding type & give flexibility to the foot.
- * The bones are connected by plantar dorsal ligaments as well as by short interosseous ligaments.

(5) The tarso-metatarsal (T.M) Joints

- (1) the T.M joint of the big toe (cuneo-metatarsal joint) is an independent joint. It is a plane synovial joint.
- (2) the T.M. (cuneometatarsal joints) of the metatarsals 2,3 are parts of the composite joint (plane synovial).
- (3) the T.M of the 4th & 5th metatarsals is the cubometatarsal joint

(6) The metatarso-phalangeal (M.P) Joints

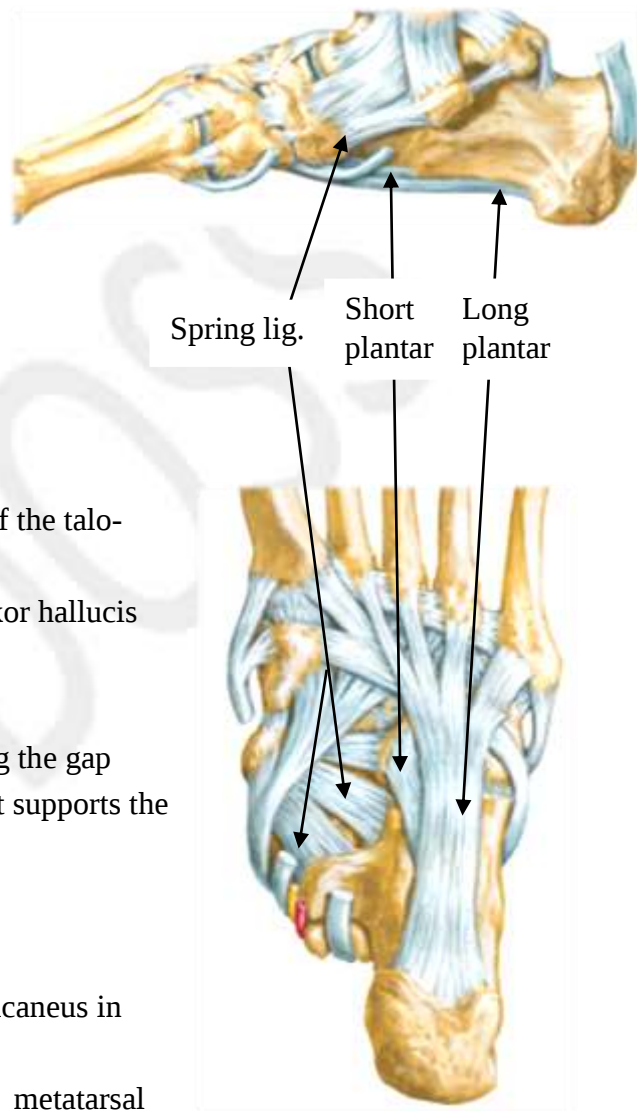
(7) The Inter-phalangeal (I.P) Joints

are similar in type & movements to those of the hand.

Ligaments of the foot

(1) Spring ligament (plantar calcaneo-navicular lig):

- * it is a strong lig. which fills the gap between the sustentaculum tali & the navicular bone.
- * it is so called because it acts as a spring below the head of talus.
- * Attachments:
 - posteriorly: to the ant. margin of the sustentaculum tali.
 - anteriorly: to the plantar aspect of navicular bone
 - its med. border: blends with the deltoid lig.



N.B: the deltoid lig. braces the spring lig. upwards

* Relations:

- (1) Its upper surface is smooth & forms part of the socket of the talo-calcaneo-navicular joint.
- (2) Its lower surface is supported by the tibialis post. & flexor hallucis longus tendons.

* Importance:

it maintains the med. longitudinal arch of the foot by filling the gap between the sustentaculum tali & the navicular bone thus it supports the head of talus.

(2) Long plantar lig. :

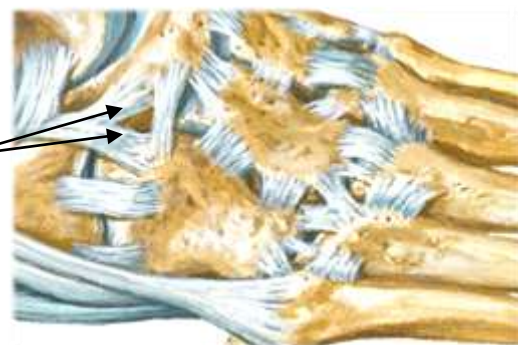
- * it is the longest & strongest of the tarsal ligaments.
- * its narrow post. end is attached to the plantar surface of calcaneus in front of the med. & lat. tub.
- * Its broad ant. end is attached to the bases of the 2nd, 3rd, 4th metatarsal bones.
- * it crosses the plantar surface of cuboid bone converting its groove for the peroneus longus into a tunnel.
- * it is important in maintaining the med. longitudinal arch of the foot.

(3) Short plantar lig. (plantar calcaneo-cuboid lig.):

- It connects calcaneus & cuboid & maintains the lat. longitudinal arch of the foot.

(4) Bifurcate lig.:

it is V-shaped lig. , attached posteriorly to plantar surface of calcaneus & divides into med. slip attached to navicular & lat. slip attached to cuboid.

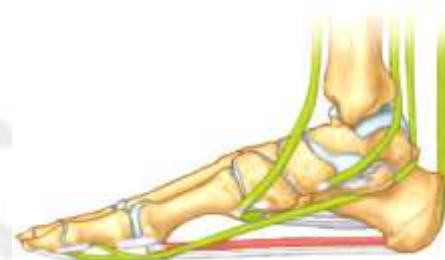


Arches of the foot

* **Definition:** the human foot is built in such a way that its bones form arches which do not come in contact with the ground when the weight of the body is born on the feet during standing.

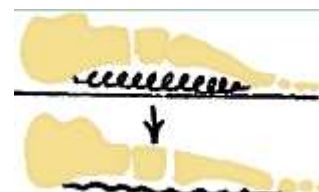
* **Classification :** the arches of the foot include:

- (1) The medial longitudinal arch : along the medial border of the foot
- (2) The lateral longitudinal arch: along the lateral border of foot & more depressed than the medial one.
- (3) the transverse arch :is marked at the bases of metatarsal bones.

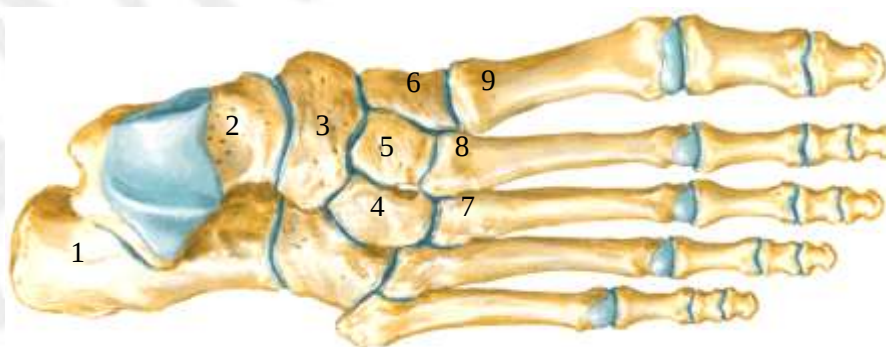


* **functions of the arches of the foot:**

- (1) Distribution of the body weight on the bones of the foot:
 $\frac{1}{2}$ of the weight reaching the talus is delivered to calcaneus while the other $\frac{1}{2}$ is transmitted forewords from talus to be distributed equally to 6 points (lateral 4 metatarsal heads + 2 sesamoid bones under the head of the 1st metatarsal.
- (2) Giving the foot elasticity & resilience of movement during locomotion.
- (3) Absorption of shocks when falling on the feet
- (4) Adaptation of the foot to irregular or sloping surfaces.
- (5) Protection of the plantar n. & vessels.



(A) The Medial longitudinal arch



I- Construction:

- * It is formed of 9 bones
- Calcaneus, talus , navicular
 - the 3 cunifrom bones
 - the med. 3metatarsal bones

II- Shape: It is arched upwards, having:

- 1) Post. pillar: (the point touching the ground behind) which is the calcanean tuberosity.
- 2) Ant. pillar (the point touching the ground anteriorly) & formed by the heads of the med. 3 metatarsal bones.
- 3) Apex (the highest point of the arch) is formed by the talus.



III- Function: the med. longitudinal arch is concerned with the elastic propulsion of the foot during walking.

IV- Factors maintaining the med. longitudinal arch:

1) Bony factors:

the construction of the bones is designed in such a way that when they articulate they form an arch.

2) Ligaments:

(a) the spring ligament:

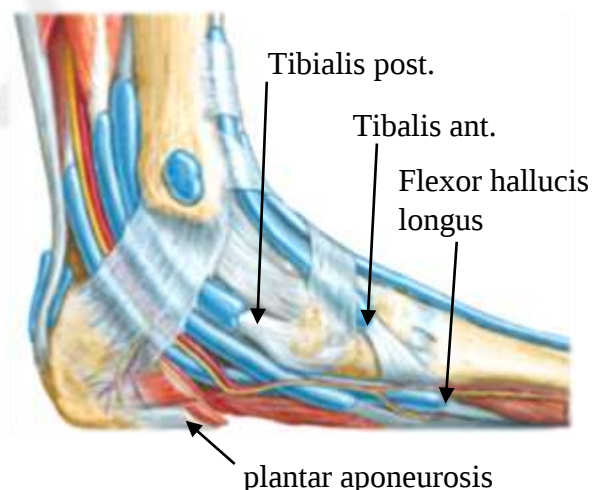
supports the summit (apex) of arch by bridging the gap below head of talus.

(b) the deltoid lig. : by bracing the spring lig. upwards & supporting the talus (which is the keystone). *

(c) the interosseous ligaments: binding the bones together.

(d) the long plantar ligament } by holding the ant. & past. pillars of the arch.

(e) the plantar aponeurosis }



3) Muscles:

- (a) tendons of → Tibialis anterior
→ Tibialis posterior
→ Flexor hallucis longus

(b) the tone of the short muscles of the big toe.

(B) The Lateral Longitudinal arch

I- Construction:

It is formed by 4 bones:

- Calcaneus
- Cuboid
- Lat. 2 metatarsals



II- Shape: it is net as high as the med. arch.

- (1) its post. pillar is formed by the calcaneus tuberosity.
- (2) its ant. pillar is formed by The bases of the 4th & 5th metatarsals.
- (3) its apex Is formed by the cuboid bone.

III- Function: it is concerned with the support of the body weight during standing (static arch).

IV- Factors maintaining it:

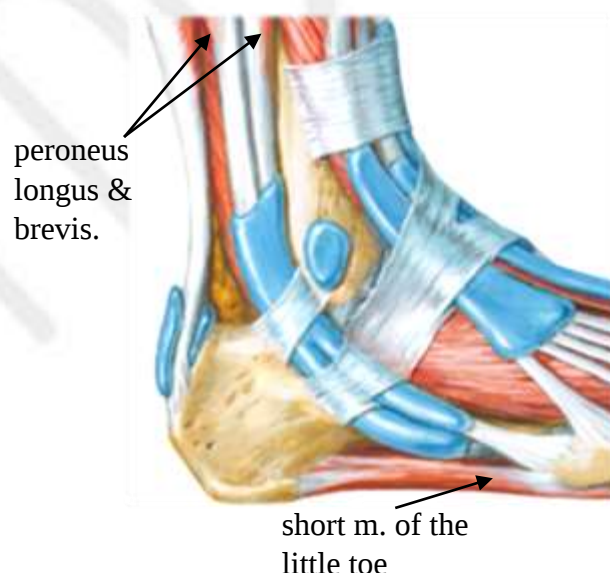
(1) Bony factors: as in med. longitudinal arch.

(2) Ligaments:

- (a) the interosseous ligaments.
- (b) the short plantar lig.
- (c) the plantar aponeurosis.

(3) Muscles:

- (a) peroneus longus & brevis.
- (b) short muscles of the little toe.



(C) The transverse arch

- it runs from side to Side
- it is formed by the tarsal bones (cuboid & 3 cunifoms)+ the bases of all metatarsal bones.

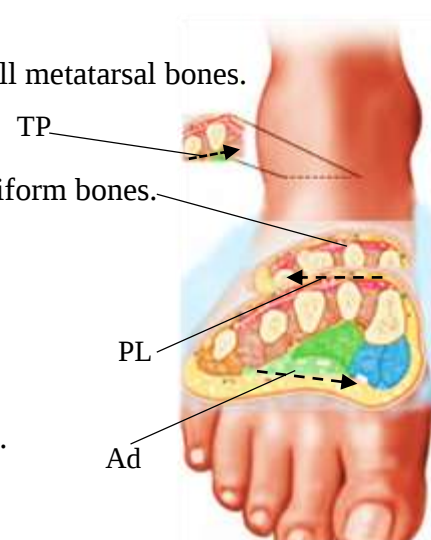
* Factors maintaining it:

(1) Bony factors: the wedge-shaped appearance of the intermed. & lat. cuniform bones.

(2) Ligaments: the strong plantar interosseous lig.

(3) Muscles:

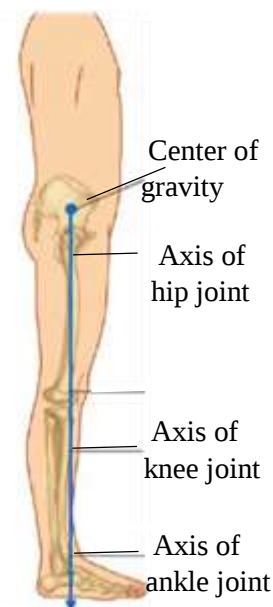
- (a) peroneus longus tendon (most important)
- (b) the slips of tibialis post. tendon (palling tarsal bones together)
- (c) the transverse head of add. hallucis (by drawing the metatarsal) bones.



Mechanism of Transmission of the Body Weight

I- In the Standing position:

- * The weight of the head & neck, U.L & trunk is transmitted through the vertebral bodies down to the 5th lumbar vertebra then delivered to the 2 hip bones through the sacro-iliac joints.
- * Each $\frac{1}{2}$ of the body weight is then transmitted via the dorsal segment of each hip bone to the acetabulum where it is delivered to the head of the femur at the hip joint.



N.B: the line of gravity passes behind the centre of the hip joint inducing hyperextension of that joint. This hyperextension is checked by the strong iliofemoral & pubofemoral lig.

- * The weight delivered to the head of femur is carried through the femoral neck (whose lower part is much thickened to support the femoral neck angle) then transmitted downwards through the shaft of the femur till its lower end.

N.B: the ant. convexity of the femoral shaft throws the line of the body weight in front of the axis of the knee joint inducing passive hyperextension which is checked by:

- (1) the articular surfaces & **the menisci** of the knee joint.
- (2) the tension of the **collateral ligaments**.
- (3) the tension of the **ant. cruciate lig**.
- (4) the tension of the **post. oblique popliteal lig**.

- * At the knee Joint, the body weight is transmitted from the lower end of the femur, mainly through the lat. condyle, to the upper end of the tibia.
- * The weight is then transmitted by the shaft of the tibia down to the ankle joint.

N.B: the line of the body weight falls in front of the ankle joint inducing hyperextension which is checked by the contraction of gastrocnemius & soleus m.

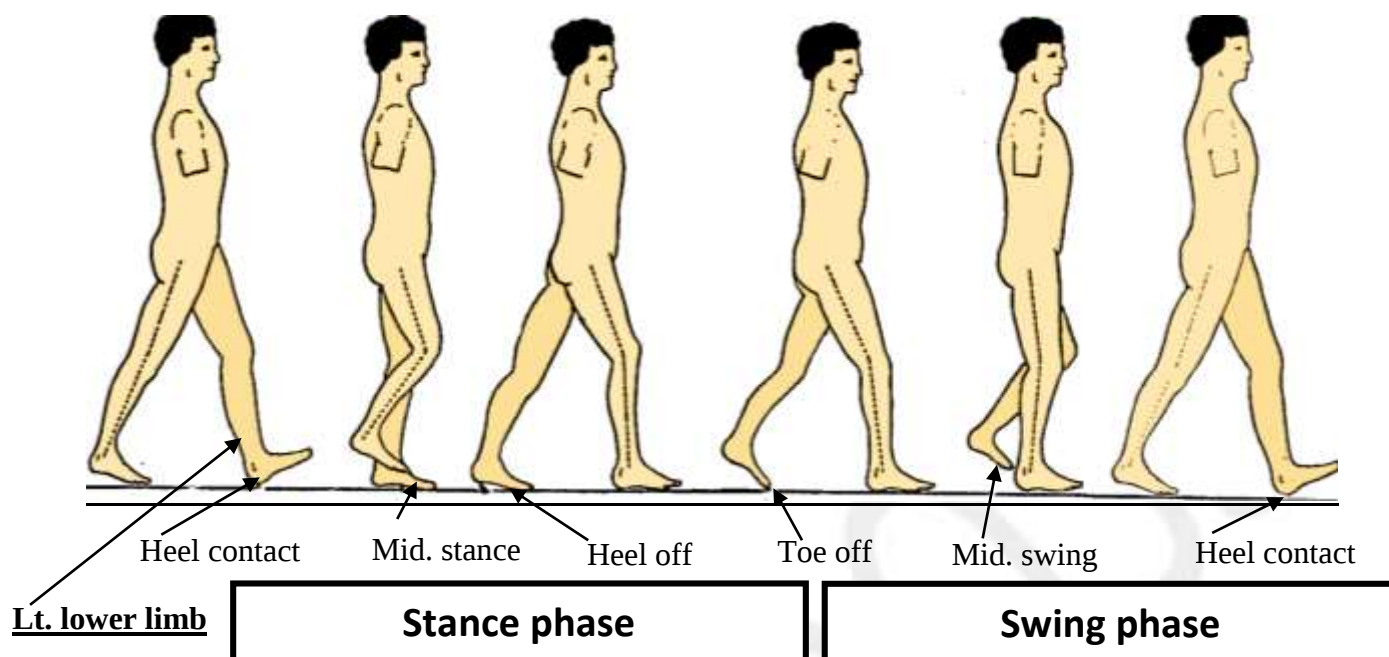
- * The weight falling on talus divides into:
 - (1) a post. $\frac{1}{2}$ which is transmitted posterior o the calcaneus.
 - (2) an ant. . $\frac{1}{2}$ which is transmitted anteriorly along the cuboid & the lat. 2 metatarsal bones to the balls of the 4th & 5th toes.

II- In the sitting position:

The weight of the body is transmitted From the vertebral Column via the sacro-iliac joinis to the dorsal segments of the 2 hip bones then falls on the 2 ischial tuberosities which are the 2 bony parts supporting the body weight in the sitting position



Mechanism of Walking



- * Walking is a composite process consisting of series of steps.
- * A complete step can be analyzed into 2 phases
 - I- stance phase ($\frac{3}{5}$ of the cycle)
 - II- swing phase ($\frac{2}{5}$ of the cycle).

I- Stance phase: the limb is on the ground:

Early stance: starts with heel strike which is the contact of the heel with the ground.

Mid-stance: the weight of the body is transmitted forwards, along the lat. border of the sole, from the heel to the heads of the metatarsal bones.

Late-stance: the heel is elevated (by contraction of soleus & gastrocnemius muscles) then the toes are raised from the ground (by contraction of the flexors of the toes). This is called toe-off which terminates the stance phase.

II- Swing phase: the limb is off the ground:

- This phase starts by the toe-off accompanied by slight Flexion of the hip & knee joints & dorsiflexion of the ankle joint. This flexion of the 3 joints helps in raising the foot more from the ground.
- The leg is then propelled forwards by the following sequence of movements:
 - (1) more flexion of the hip.
 - (2) Full extension of the knee.
 - (3) more dorsiflexion of the ankle.
 - (4) forward movement of the pelvis which pushes the extended leg forwards
- The swing phase ends by heel strike when the heel comes in contact with the ground again.

Muscles Keeping Balance During Standing

I- Stability of the pelvis on the femur:

(A) During standing on both lower limbs, the stability of the pelvis is ensured by the combined action of the following muscles:

- (1) the guy ropes (Sartorius gracilis & semitendinosus): they arise from 3 distant points in the hip bone but share a common insertion in the upper part of med. Surface of tibia. They steady the pelvis on the head of femur.
- (2) The Sartorius & straight head of rectus femoris counteract the hyperextension tendency of the hip joint.

(B) During Standing on one limb only: the stability of the pelvis is ensured by the combined action of gluteus medius & minimus which prevent the tilt of the pelvis towards the unsupported side.

II- Stability of the knee Joint:

- (1) the iliotibial tract (which receives the insertion of tensor fascia latae m. & the superficial $\frac{3}{4}$ of gluteus maximus), acts as a powerful brace which helps to steady the pelvis & keep the knee joint firmly extended.
- (2) the quadriceps femoris m. contracts only when active extension of the knee is needed. In this respect it counteracts the action of the hamstrings & the gastrocnemius.

III- Stability of the ankle Joint:

Is ensured by the interaction between the ant. tibial muscles (dorsiflexion of the ankle), counter balanced by the action of the gastrocnemius, soleus & the long flexors of the toes.

IV- Tendency of the leg to shift laterally or medially:

Is prevented by the contraction of the flexor tendons medially & the peroneal muscles laterally.

Index of Contents

	Page
1- Bones of the lower limb.....	3 - 30
2- Fascia lata.....	31 - 34
3- Gluteal region.....	34 - 41
4- Muscles of the iliac region and front of thigh.	42 - 45
5- Muscles of medial side of thigh.....	46 - 48
6- Femoral triangle.....	49 - 52
7- Adductor canal.....	53 - 54
8- Muscles of back of the thigh.....	55 - 56
9- Popliteal fossa.....	57- 63
10- Muscles of the leg.....	64 - 68
11- Retinacula of the ankle.....	69 - 70
12- The foot.....	71 - 75
13- Arterial supply of L.L.	76 - 87
14- Venous drainage of L.L.	88 - 90
15- Lymphatic drainage of L.L.	91
16- Nerve supply of L.L.	92 - 109
17- Joints of the L.L.	109 - 128
18- Arches of the foot.....	129 - 131
19- Mechanism of transmission of the body weight.....	132
20- Mechanism of walking	133
21- Muscles keeping balance during standing.....	134

*** Information has been corrected according to another references.**

Anatomy Lower Limb Sameh Doss

Atlas of Human Anatomy, 5th Edition

Gray's Anatomy For Students, 3rd Edition

Moore Clinically Oriented Anatomy, 7th Edition

Snell's Clinical Anatomy By Regions, 9th Edition

McMinn and Abraham's Clinical Atlas of Human Anatomy

[Netter Atlas 7th edition.pdf](#)

Essential Anatomy 3D

<https://images.app.goo.gl/mywokwuAEHQBneQM6h>

<https://images.app.goo.gl/fm3Km6Fbjr8xCQbz8>

<https://images.app.goo.gl/HZ2DSi3U7bx88nBg8>

<https://images.app.goo.gl/JefrbWm6Pc84m7tX8>

<https://images.app.goo.gl/JC4EMhogt9y9JCdB6>

<https://images.app.goo.gl/5TTFQFmXNVXtCdJs9>

<https://images.app.goo.gl/yH4KJf14sTDAgL2r5>

[xnqz9https://images.app.goo.gl/jjjNHgZLHfhk](https://images.app.goo.gl/jjjNHgZLHfhk)

<https://images.app.goo.gl/3JESdhJR26ad5Bu7>

<https://images.app.goo.gl/oX8fXEHR7d9TpLS8>

<https://images.app.goo.gl/XkSRktzsVxB7Xep6>

<https://www.google.com/url?sa=t&source=web&rct=j&url=https://yandex.com/images/touch/&ved=2ahUK Ewj1-6n14KrZAhWaAWMBHe4vCIUQFnoECAoQAg&usg=AOvVaw1QwCpyFDVGWxOjjLLsRT4m&cshid=1633144448959>

<https://www.google.com/url?sa=t&source=web&rct=j&url=https://yandex.com/images/touch/&ved=2ahUK Ewj1-6n14KrZAhWaAWMBHe4vCIUQFnoECAoQAg&usg=AOvVaw1QwCpyFDVGWxOjjLLsRT4m&cshid=1633144448959>

<https://www.google.com/url?sa=t&source=web&rct=j&url=https://yandex.com/images/touch/&ved=2ahUK Ewj1-6n14KrZAhWaAWMBHe4vCIUQFnoECAoQAg&usg=AOvVaw1QwCpyFDVGWxOjjLLsRT4m&cshid=1633144448959>

<https://www.google.com/url?sa=t&source=web&rct=j&url=https://yandex.com/images/touch/&ved=2ahUK Ewj1-6n14KrZAhWaAWMBHe4vCIUQFnoECAoQAg&usg=AOvVaw1QwCpyFDVGWxOjjLLsRT4m&cshid=1633144448959>

<https://www.google.com/url?sa=t&source=web&rct=j&url=https://yandex.com/images/touch/&ved=2ahUK Ewj1-6n14KrZAhWaAWMBHe4vCIUQFnoECAoQAg&usg=AOvVaw1QwCpyFDVGWxOjjLLsRT4m&cshid=1633144448959>

<https://www.google.com/url?sa=t&source=web&rct=j&url=https://yandex.com/images/touch/&ved=2ahUK Ewj1-6n14KrZAhWaAWMBHe4vCIUQFnoECAoQAg&usg=AOvVaw1QwCpyFDVGWxOjjLLsRT4m&cshid=1633144448959>

<https://www.google.com/url?sa=t&source=web&rct=j&url=https://yandex.com/images/touch/&ved=2ahUK Ewj1-6n14KrZAhWaAWMBHe4vCIUQFnoECAoQAg&usg=AOvVaw1QwCpyFDVGWxOjjLLsRT4m&cshid=1633144448959>

<https://www.google.com/url?sa=t&source=web&rct=j&url=https://yandex.com/images/touch/&ved=2ahUK Ewj1-6n14KrZAhWaAWMBHe4vCIUQFnoECAoQAg&usg=AOvVaw1QwCpyFDVGWxOjjLLsRT4m&cshid=1633144448959>

<https://www.google.com/url?sa=t&source=web&rct=j&url=https://yandex.com/images/touch/&ved=2ahUK Ewj1-6n14KrZAhWaAWMBHe4vCIUQFnoECAoQAg&usg=AOvVaw1QwCpyFDVGWxOjjLLsRT4m&cshid=1633144448959>

<https://www.google.com/url?sa=t&source=web&rct=j&url=https://yandex.com/images/touch/&ved=2ahUK Ewj1-6n14KrZAhWaAWMBHe4vCIUQFnoECAoQAg&usg=AOvVaw1QwCpyFDVGWxOjjLLsRT4m&cshid=1633144448959>

<https://www.google.com/url?sa=t&source=web&rct=j&url=https://yandex.com/images/touch/&ved=2ahUK Ewj1-6n14KrZAhWaAWMBHe4vCIUQFnoECAoQAg&usg=AOvVaw1QwCpyFDVGWxOjjLLsRT4m&cshid=1633144448959>

<https://www.google.com/url?sa=t&source=web&rct=j&url=https://yandex.com/images/touch/&ved=2ahUK Ewj1-6n14KrZAhWaAWMBHe4vCIUQFnoECAoQAg&usg=AOvVaw1QwCpyFDVGWxOjjLLsRT4m&cshid=1633144448959>

<https://www.google.com/url?sa=t&source=web&rct=j&url=https://yandex.com/images/touch/&ved=2ahUK Ewj1-6n14KrZAhWaAWMBHe4vCIUQFnoECAoQAg&usg=AOvVaw1QwCpyFDVGWxOjjLLsRT4m&cshid=1633144448959>

<https://www.google.com/url?sa=t&source=web&rct=j&url=https://yandex.com/images/touch/&ved=2ahUK Ewj1-6n14KrZAhWaAWMBHe4vCIUQFnoECAoQAg&usg=AOvVaw1QwCpyFDVGWxOjjLLsRT4m&cshid=1633144448959>

<https://www.google.com/url?sa=t&source=web&rct=j&url=https://yandex.com/images/touch/&ved=2ahUK Ewj1-6n14KrZAhWaAWMBHe4vCIUQFnoECAoQAg&usg=AOvVaw1QwCpyFDVGWxOjjLLsRT4m&cshid=1633144448959>

[6n14KrzAhWaAWMBHe4vCIUQFnoECAoQAg&usg=AOvVaw1QwCpyFDVGWxOjjLLsRT4m&cshid=1633144448959](https://www.google.com/search?q=image+of+superior+and+inferior+gemellus+muscles&tbm=isch#imgsrc=ws0Hc-U3dGLV4M)
<http://www.earthslab.com>
<http://twitter.com>
<https://www.google.com/search?q=image+of+superior+and+inferior+gemellus+muscles&tbm=isch#imgsrc=ws0Hc-U3dGLV4M>
<https://images.app.goo.gl/dMhzfWo9nuagwLC49>
<http://www.physio-pedia.com>
<https://i2.wp.com/ptmasterguide.com/wp-content/uploads/2019/10/03fef17b3ca2d876b69fd79d9a7638ed2.png?fit=495%2C479&ssl=1>
https://www.google.com/url?sa=i&url=https%3A%2F%2Frad.washington.edu%2Fmuscle-atlas%2Fobturators-externus%2F&psig=AOvVaw2z1Qu0Ks300XtaB5xWybG6&ust=1632693150532000&source=images&cd=vfe&ved=0CAkQjhXqFwoTCMDR9ZK0m_MCFQAAAAAdAAAAABAD
<https://images.app.goo.gl/czFj1CaR6YDs1zuY7>
https://fscomps.fotosearch.com/compc/LIF/LIF137/structures-passing-through-the-greater-stock-illustration_gd308006.jpg
<https://www.semisportmed.com/wp-content/uploads/2018/10/56fc15a79c690.jpg>
<http://www.ncbi.nlm.nih.gov>
<http://sbrsport.me>
<https://w7.pngwing.com/pngs/219/799/png-transparent-silhouette-business-chair-man-alone-think-people-rest-seated-pensive.png>
https://d3e1m60ptf1oym.cloudfront.net/3eacfa6-a7cb-498b-8cb4-ae8416a9f45a/knee-musculus-sartorius-gracilis-semitendinosus-muscle-muscle-pes-anserinus-anserine-syndrome_xlarge.jpg
<https://image.slidesharecdn.com/femoraltriangle-190305124302/95/femoral-triangle-7-638.jpg?cb=1551789890>
https://i0.wp.com/neupsykey.com/wp-content/uploads/2019/05/9781626238909_c007_f003.tif_epub1.jpg?w=960
<http://en.wikipedia.org>
<http://ru.m.wikipedia.org>
https://www.earthslab.com/wp-content/uploads/2017/08/082617_0730_KNEEBURSAE1-1.jpg
<https://learnmuscles.com/glossary/articularis-genus/>
<https://t.me/c/1510361376/302>
<http://www.ncbi.nlm.nih.gov>
<http://en.wikipedia.org>
[https://thumbor.kenhub.com/VP_iLE4Jk529n0WBM29DeW-sac8=/fit-in/800x1600/filters:watermark\(/images/logo_url.png,-10,-10,0\):background_color\(FFFFFF\):format\(jpeg\)/images/article/en/the-hip-adductors/GnYu3kkn8bt9ifsgt3Ug_M_adductor_magnus_NN_1.png](https://thumbor.kenhub.com/VP_iLE4Jk529n0WBM29DeW-sac8=/fit-in/800x1600/filters:watermark(/images/logo_url.png,-10,-10,0):background_color(FFFFFF):format(jpeg)/images/article/en/the-hip-adductors/GnYu3kkn8bt9ifsgt3Ug_M_adductor_magnus_NN_1.png)
[https://thumbor.kenhub.com/VP_iLE4Jk529n0WBM29DeW-sac8=/fit-in/800x1600/filters:watermark\(/images/logo_url.png,-10,-10,0\):background_color\(FFFFFF\):format\(jpeg\)/images/article/en/the-hip-adductors/GnYu3kkn8bt9ifsgt3Ug_M_adductor_magnus_NN_1.png](https://thumbor.kenhub.com/VP_iLE4Jk529n0WBM29DeW-sac8=/fit-in/800x1600/filters:watermark(/images/logo_url.png,-10,-10,0):background_color(FFFFFF):format(jpeg)/images/article/en/the-hip-adductors/GnYu3kkn8bt9ifsgt3Ug_M_adductor_magnus_NN_1.png)
<https://teachmeanatomy.info/wp-content/uploads/Borders-of-the-Femoral-Triangle.jpg>
<https://image.slideserve.com/1427210/femoral-triangle1-l.jpg>
<https://d45jl3w9libvn.cloudfront.net/jaypee/static/books/9789351529637/Chapters/images/307-1.jpg>
<https://images.app.goo.gl/jYgnyGbDYcrqmtU7>
<http://www.slideshare.net>
<https://images.app.goo.gl/AZQkYj8dPqAY1F9d8>
<https://rxharun.com/knee-pit-nerve-supply-muscle-attachment-functions>

[https://thumbor.kenhub.com/HmGUG8OPhVrckaK-yea6NK8t3Uk=/fit-in/940x940/filters:fill\(FFFFFF,true\):watermark\(/images/watermark_only.png,0,0,0\):watermark\(/images/logo_url.png,-10,-10,0\):format\(jpeg\)/images/anatomy_term/femoral-artery-6/zcqsQyBpEmyN6cQOuZ16Q_Femoral_artery_Zoomed_res.png](https://thumbor.kenhub.com/HmGUG8OPhVrckaK-yea6NK8t3Uk=/fit-in/940x940/filters:fill(FFFFFF,true):watermark(/images/watermark_only.png,0,0,0):watermark(/images/logo_url.png,-10,-10,0):format(jpeg)/images/anatomy_term/femoral-artery-6/zcqsQyBpEmyN6cQOuZ16Q_Femoral_artery_Zoomed_res.png)
https://media.springernature.com/lw785/springer-static/image/chp%3A10.1007%2F978-94-017-9834-1_27/MediaObjects/322918_1_En_27_Fig1_HTML.gif
https://www.uptodate.com/contents/images/SURG/54240/Anatomy_of_dorsalis_pedis_artery.jpg
<https://doctorlib.info/surgery/plastic/plastic.files/image1146.jpg>
<https://els-jbs-prod-cdn.jbs.elsevierhealth.com/cms/attachment/82c00bdd-f713-4596-98f8-c7d1c60f601e/gr9a.jpg>
[👉 Gamba Emoji](#)
[Saphenous Vein Reflux Therapies | Curing Varicose Veins | Austin Texas](#)
[thoracic wall Flashcards | Quizlet](#)
[Venous Drainage of the Lower Limb - TeachMeAnatomy](#)
[USMLE Notes - Femoral triangle BACKWARDS VAN](#)
[Femoral triangle - www.medicoapps.org](#)
[Pin on Lymphatic drainage](#)
[3 Anatomy of the lumbar plexus nerves \(Image by Springer\) | Download Scientific Diagram](#)
<file:///C:/Users/MC/Downloads/90.1.htm>
[7 Best Femoral nerve ideas | femoral nerve, nerve entrapment, nerve](#)
[Femoral nerve](#)
<file:///C:/Users/MC/Downloads/92.2.html>
[Musculoskeletal Key | Fastest Musculoskeletal Insight Engine](#)
[Thigh | Concise Medical Knowledge](#)
[JaypeeDigital | Front and Medial Side of Thigh](#)
[Plantar nerve - Wikipedia](#)
[JaypeeDigital | Lumbosacral Plexus](#)
[Drawing of lumbosacral plexus and relevant derivative nerves:... | Download Scientific Diagram](#)
[Nerve Repair and Reconstruction—Sciatic Nerve and Femoral Nerve | Plastic Surgery Key](#)
[latissimus dorsi Gluteus medius Gluteus maximus Vastus lateralis Semitendinosus Biceps femoris](#)
[Semimembranosus | Ballet shoes, Glutes, Anatomy and physiology](#)
[JaypeeDigital | Popliteal Fossa](#)
[Ozari's Kinesiotherapy Clinic المنشورات](#)
[Pin on Health](#)
[Pin on Nursing Interventions](#)
[Nerves of Lower Limb Dr Fadel Naim Orthopedic](#)
<https://www.earthslab.com/anatomy/sciatic-nerve/>
<https://www.google.com/url?sa=t&source=web&rct=j&url=https://yandex.com/images/touch/&ved=2ahUKE>

